TAMPEREEN TEKNILLINEN YLIOPISTO
TAMPERE UNIVERSITY OF TECHNOLOGY

JUSSI-PEKKA TEINI

A DIGITAL CAMPUS IN 2030: THE CASE OF THREE MERGING HIGHER EDUCATION INSTITUTIONS IN TAMPERE

Master of Science thesis

Examiners: lect. Risto Mikkonen and Prof. Petri Nokelainen
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ABSTRACT

JUSSI-PEKKA TEINI: A Digital Campus in 2030: The Case of Three Merging Higher Education Institutions in Tampere
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Digitalization is one of the most central megatrends currently altering our society. In the last decades higher education has not, however, transformed in proportion with the possibilities digitalization has to offer. The merging process of three higher education institutions in Tampere sets in motion a transformation process in which a digital leap is a central goal for several reasons, such as financial savings, enhancing cross-disciplinary learning and research in physically separate locations, and enhancing the availability and accessibility of information and services.

The theoretical framework of the thesis consists of futures research of higher education, defining a digital campus, and communities of practice. The methodology of the thesis is based on a futures research method, Policy Delphi, and methods of analyzing qualitative data, content analysis and thematic analysis. The Delphi technique is an anonymity- and iteration-based process of structured interaction of a selected panel of experts. The Policy Delphi utilized in this research consisted of three iterative rounds, with the first round being a semi-structured interview and later rounds being web-based surveys. The Policy Delphi resulted in 72 claims regarding the future of Tampere3 or Finnish higher education in general. The experts' panel evaluated the claims both numerically on dimensions of desirability and probability, and verbally to provide additional arguments to the numerical evaluation. In addition to the Delphi content, the thesis also utilizes data produced in a Tampere3 workshop on the digitalization of higher education.

The research demonstrates that higher education institutions have not succeeded in utilizing the potential of digitalization, and that its development requires more resources. Academic communality is predicted to be emphasized through the development of technology to promote interaction, and through the utilization of modern pedagogical solutions. These trends also transform academic work to be more interactive and cross-disciplinary. Digitalization disrupts the whole higher education sector by enabling operation in the global market. Digitalization also enables modular and scalable content, allowing for more versatile and flexible content usage, for example in the growing needs of complementary education. The higher education institutions need to adapt a more user-centered and open modus operandi in order to uphold their appeal in the digital era. The importance of stakeholder co-operation increases as public funding decreases and the requirements for the transparency of public funding tighten.

TIIVISTELMÄ

JUSSI-PEKKA TEINI: Tampereen yhdistyvien korkeakoulujen digitaalinen kampus vuonna 2030
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Avainsanat: korkeakoulutus, tulevaisuudentutkimus, käytäntöyhteisö, digitalisaatio, Delphi

Digitalisaatio on kenties merkittävin tämänhetkinen yhteiskuntaamme muovaava megatrendi. Toistaiseksi sen vaikutus korkeakoulutukseen vaikuttaisi kuitenkin olevan potentiaaliin nähden vähäinen. Kolmen tamperelaisen korkeakoulun yhdistymisprosessi Tampere3 tarjoaa taitekohdan, jonka yhteydessä digitalisaation kehitysloikka on mahdollinen ja tärkeä tavoite useista syistä. Esimerkkeinä mainittakoon kustannussäästöt, poikkitieteellisyyden lisääminen opetuksessa ja tutkimuksessa fyysisesti eri paikoissa sijaitsevien ihmisten välillä sekä palveluiden ja tiedon saatavuuden ja saavutettavuuden edistäminen.

Tutkimuksen ongelmaa lähestytään korkeakoulutuksen tulevaisuudentutkimuksen, digitaalisen kampuksen määrittelyn sekä oppimisyhteisöjen viitekehysten kautta. Tutkimuksen metodologiana toimivat tulevaisuudentutkimuksen Delphi-menetelmä sekä kvalitatiivisen aineiston analysointiin kehitetyt sisällönanalyysi sekä temaattinen analyysi. Pääroolissa oleva Delphi-menetelmä on anonymiteettiin ja iteraatioon perustuva strukturoitu vuorovaikutusmenetelmä, jossa tutkimuksen tulokset tuottaa valikoitu asiantuntijapaneeli. Tutkimuksessa käytetty Policy Delphi –variaatio rakentuu haastattelukierroksesta ja kahdesta sähköisestä kyselykierroksesta edellisen kierroksen luodessa aina seuraavan kierroksen sisällön. Policy Delphi –menetelmän tuloksena on 72 väittämää kymmenestä teemasta Tampere3-korkeakoulujen tai laajemmin suomalaisen korkeakoulutuksen tulevaisuudesta. Panelistit arvioivat väittämiä numeerisesti niiden toivottavuuden ja toteutumistodennäköisyyden osalta sekä avoimesti sanallisesti perustellen. Delphi-menetelmän lisäksi tutkimuksen aineistona hyödynnettiin Tampere3-prosessin yhteydessä järjestetyn korkeakoulutuksen digitalisointia käsittelevän työpajan tuloksia.

Tutkimuksen aineistosta on nähtävissä vahva konsensus siitä, että korkeakoulut eivät ole toistaiseksi onnistuneet valjastamaan digitalisaation potentiaalia ja sen kehitystä pitäisi resursoida enemmän. Akateemisen yhteisöllisyyden nähtiin korostuvan teknisten apuvälineiden kehittyessä sekä modernin pedagogiikan hyödyntämisen kautta. Nämä myös muuttavat akateemisen työn luonnetta vuorovaikutteellisemmaksi ja poikkitieteellisemmäksi. Digitalisaatio disruptoi koko korkeakoulukenttää mahdollistamalla globaalin tarjonnan. Digitalisoitu korkeakoulutus mahdollistaa paitsi kansainvälisillä markkinoilla kilpailun, myös modulaarisen ja skaalautuvan sisällön, jonka myötä samaa sisältöä voidaan hyödyntää monipuolisemmin ja joustavammin esimerkiksi kasvaviin täydennyskoulutustarpeisiin. Korkeakoulujen tulee myös toimia yhä ihmislähtöisemmin ja avoimemmin ollakseen kiinnostava toimija digitaalisella aikakaudella. Sidosryhmäyhteistyön merkitys kasvaa julkisen rahoituksen tiukentuessa, sekä julkisen rahoituksen läpinäkyvyysvaatimusten kiristyessä.

PREFACE

This master of science thesis was conducted as a part of the merger process of three higher education institutions in Tampere (Tampere3). The research was procured by Tampere3 director Päivi Myllykangas and the official employer was the department of Strategic Management in Tampere University of Technology.

First of all I wish to express my gratitude to my family and friends for all sorts of support both in conducting this thesis and in studies and life in general. Special thanks go to my partner in life, Eveliina, for making me happy.

Thank you Risto Mikkonen and Petri Nokelainen for supervising my thesis and Petri Ihantola and Markus Pöllänen for also contributing to the substance of the thesis. The Tampere3 team Päivi Myllykangas, Susanna Saarinen, Eeva Kiiskinen and Susanna Ketola have my deepest gratitude for accepting me as a thesis worker in the project and for their support in the process of conducting the thesis.

A major part of my skills, competences and knowledge regarding higher education systems have developed in guidance of the higher education experts Juhani Nokela, Sanja Mursu, Pirre Hyötynen, Jari Jokinen and Kati Korhonen-Yrjänheikki of Academic Engineers and Architects in Finland TEK. I am forever thankful for your support and career advice. Special shout out goes to Juhani for coming up with the topic of my thesis.

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My passion towards higher education systems sparked when working in the Student Union of Tampere University of Technology (TTYY). I would like to thank the 2013-2015 boards and employees of TTYY for a memorable start in my early career.

Last but not least I would like to thank the near past, present and near future operational management of Tampere University of Technology: Markku Kivikoski, Mika Hannula, Petri Suomala, Ulla Ruotsalainen, Jarmo Takala and Kirsi Reiman to name a few. TUT has seen major developments in the short time I've spent there thanks to your enthusiasm in making TUT a world-class university. Starting the merger process known as Tampere3 is probably the most crucial and greatest decision the university has ever made.

Tampere, 18 September 2016
Jussi-Pekka Teini

CONTENTS

LIST OF SYMBOLS AND ABBREVIATIONS

AR	Augmented reality
etc.	et cetera: and others; and so forth; and so on
e.g.	exempli gratia: for example
h	hour
HE	Higher education
HEI	Higher education institution
IT	Information technology
ICT	Information and communications technology
LMS	Learning management system
min	minute
MOOC	Massive open online course
TAMK	Tampere University of Applied Sciences
Tampere3	The working title of the new HEI forming with the merger of TAMK, TUT and UTA
TUT	Tampere University of Technology
UTA	University of Tampere
VR	Virtual reality

1. INTRODUCTION

With the technological development that humankind has achieved, digitalization has become a megatrend dominating the development of most aspects of modern society. Digitalization or some of its subthemes are likely highlighted in every meeting, lecture, keynote and conversation looking even slightly into the future (or even the present). But what exactly is digitalization? It's not uncommon for the hyped megatrends to have different meanings to different people as the words are assimilated from different contexts instead of a source that would begin with or conclude to a definition.

To define digitalization in the scope of this thesis, it is also necessary to define digitization. The two words have little difference in their spelling but their meanings have a great difference. As Brennen and Kreiss (2014) have defined, *digitization is the material process of converting individual analogue streams of information into digital bits*. This is perhaps how many people also understand digitalization. Digitalization can be regarded as an umbrella term for digitization as it is a broader phenomenon than just the act of digitizing. Brennen and Kreiss define digitalization as *the way in which many domains of social life are restructured around digital communication and media infrastructures.* Brennen and Kreiss stress that these definitions derive from how scholars have adapted to perceive the terms.

1.1 Digitalization and higher education

Higher education (HE) is no exception regarding the comprehensive disruptiveness of digitalization. However, HE is often considered to have substantial inertia causing changes in academia to develop slowly compared to other types of organizations. Comparing the digitization rate of HE with other types of institutions would require extensive research, but regardless of the accuracy of the assumption, it is evident that higher education institutions (HEI) have a great amount of potential to further develop their utilization of digitalization.

To date, HEIs have had very few incentives to emphasize digitalization in their development. Digitalization has mostly been utilized in the automation of administrative processes since it is known to result in financial savings. The research side of HE has also utilized digitalization somewhat extensively, e.g. for virtual interaction and digitized databases.

The development of digital solutions for teaching and learning has been slower to mature. Digitalization of teaching and learning to date has become most apparent in the form of

Learning Management Systems (LMS) such as Moodle. The systems are, however, mostly focused on automating the administrative processes of teaching, such as sharing content and returning and grading assignments. Despite the widespread use of LMS, digitalization has had relatively little effect on how we learn.

Pedagogy has taken leaps forward, as has the understanding of what the most effective ways of learning are. There are many views, but none of them supports the "traditional" way of teaching or learning. The development of teaching and learning naturally requires the pedagogical training of teachers more than anything else, but technology can assist in both the training, and the transition to new ways of learning. Pedagogically good teaching could also be digitized and automated to a large extent, by combining the research of learning analytics and pedagogy. The transition to a better utilization of technological solutions in education doesn't seem to be hindered by lack of infrastructure either. For example, according to an "ECAR" research conducted by EDUCAUSE, over 90 % of students in Tampere University of Technology (TUT) have smartphones and laptops, and in addition the university provides students with computer classrooms. On the staff side, the percentage of laptop or smartphone owners also covers close to 90 %. (ECAR Study of Students and Technology 2015, ECAR Study of Faculty and Technology 2015)

Massive Open Online Courses (MOOC) have somewhat disrupted digital teaching and learning by creating a new business model utilizing digitalization. The scalability and modularity of digital content provides a chance to offer high quality courses with the best teachers possible, for a nominal fee, or free of charge. MOOCs have also attracted aggregators to the business field of higher education. However revolutionary MOOCs sound though, at least to date they have not really reached their potential. Only a fragment of the people starting a MOOC course fully complete it.

Finland has already had some major projects in the digitalization of higher education with virtual university (virtuaaliyliopisto) and virtual university of applied sciences (virtuaali-AMK) projects that were active around 2000-2009. Arguably the projects did not succeed in the long run, but evaluations of both projects do highlight some permanent changes in the practices, and the *modus operandi* of HEIs. (OKM 2007, Lehto 2009)

Naturally, digitalization and digitization are not valuable per se. OECD has concrete results of how high utilization rate of ICT in teaching in schools has not yielded noticeably better results in PISA results in reading, mathematics or science. (OECD 2015) Digitalization is not a means to an end, it is a tool to create value by the automation of existing processes or by creating completely new possibilities of operation.

1.2 Digitalization and Tampere3

This thesis will explore the possibilities and expectations of internal and external stakeholders regarding the digital campus of Tampere3 in the year 2030. Tampere3 is a process

of merging three HEIs located in Tampere, Finland; Tampere University of Applied Sciences (TAMK), Tampere University of Technology (TUT) and University of Tampere (UTA). The merging process sets a fertile ground for a digital leap in the new institution. One of the major goals in the merging process is to promote and strengthen cross-disciplinary cooperation between institutions in order to enhance teaching and learning, research and societal impact, which is also a global HE trend of the current decade. (Tirronen 2015) Even if the new institution shuffled the current physical locations of departments and faculties, the physical distance between the campuses would still set major barriers to cross-disciplinary collaboration of individuals, or groups located in different campuses. Even with the maximum distance between two campuses being no more than eight kilometers and with Tampere currently procuring a tram that will ease transition between campuses, people would still need to reserve at least 30 minutes time for transition. The physical distance between campuses is illustrated in picture 1. A key characteristic of the digital campus is minimizing the disadvantages caused by physical distance between campuses.

A number of reasons require people to transition between campuses. Firstly, students might need to move to another campus for a lecture or some other teaching and learning event that is not available at their campus. Secondly, staff may need to move between campuses for teaching or research related issues, or for a meeting. Utilization of virtual learning possibilities would reduce the need of transfer for both the students and the teaching staff. It is, however, important to account for the attachment of students and the development of communality, which will most likely require sufficient face-to-face interaction in teaching and learning activities in the future as well. Research collaboration should also be supported by digital solutions to ensure smooth long-distance collaborative efforts. As physical distance is a factor that can be negated by technology, the solutions for internal usage of Tampere3 will also be scalable to wider collaboration on a national, and international level assuming compatibility of systems.

Another important feature is the availability of all services in every campus. Among other goals HEI mergers tend to aim for economies of scale in administrative costs, which is most effective if the services can be centralized. Combining centralization, and the requirement of availability of services in all campuses, the solution will likely need to be digital. As with the requirement of services within campuses, the demand for the availability of services outside of campus area is increasing. Stakeholder collaboration, both on a national and international level, is increasing. Even though virtual collaboration possibilities constantly advance, face-to-face interaction is likely to hold its ground at least in short term. This necessitates more movement of HEI employees, who need to be able to work during transition. The stakeholders collaborating with a HEI would also most likely want to access the services from outside of the campus area.

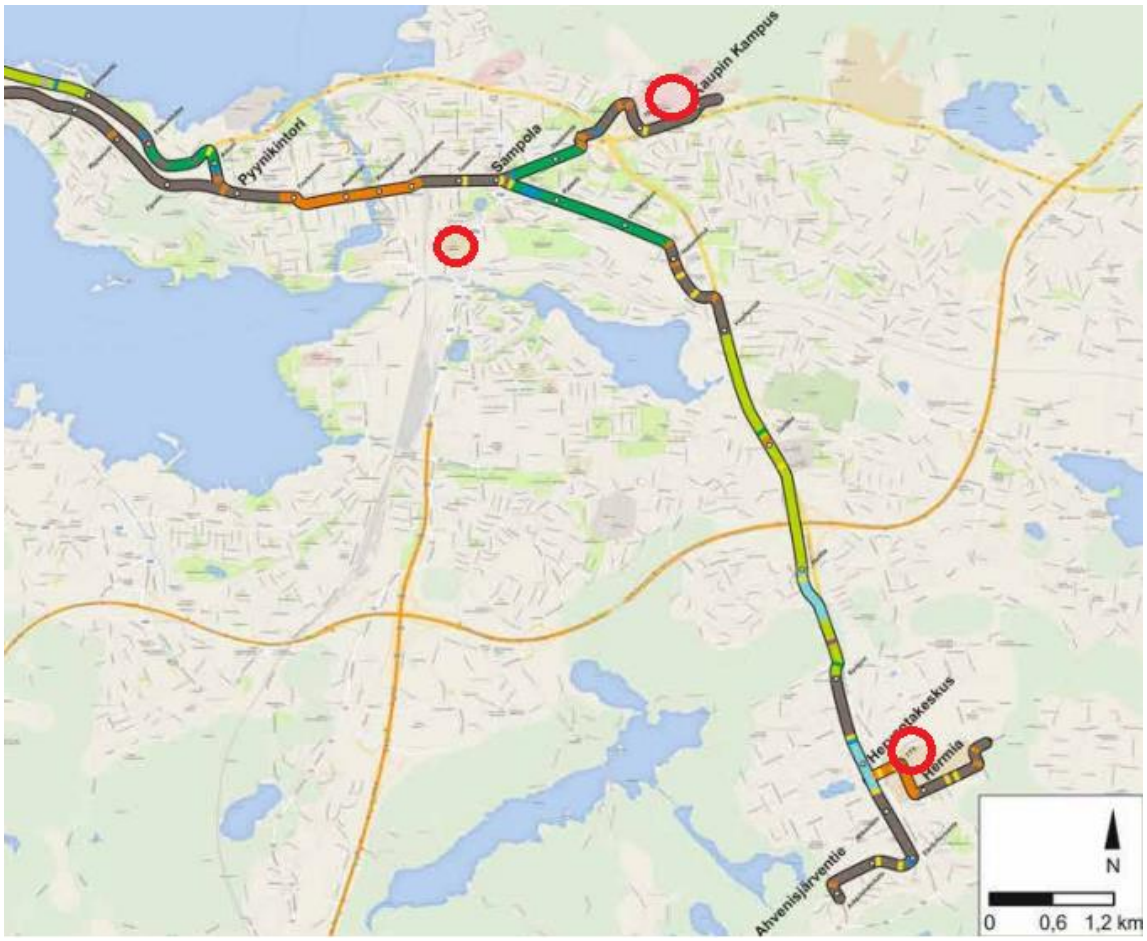

Figure 1. *The distance between campuses and the upcoming tram route. The campuses are highlighted with red circles. The northernmost campus includes campuses of TAMK and UTA, the central one is the main campus of UTA and the southernmost campus is TUT. Source: City of Tampere (2014)*

The aspects discussed above are only projections of the current operations of HEIs in the digital era. It is likely that the list of needs will only grow as we advance towards 2030, with new kinds of operations and business models enabled by constantly developing technologies. The aim of this thesis is to tackle the currently known needs, and to forecast possible new needs. The theoretical framework of the thesis is described in the second chapter: futures research regarding higher education is explored, digital campus in the context of this thesis is defined, and a modern learning theory, communities of practice is explained. The third chapter consists of methodological background which mostly relies on the Delphi-tecnique, but also includes thematic analysis.

Chapter four covers the results of the Delphi technique and a workshop regarding the future of education in Tampere3. To enhance the readability of the thesis most of the results of the Delphi are in Appendix 3 due to the extensive amount of material. It is, however, of utmost importance for anyone wishing to utilize the results of this thesis in practice, to familiarize with these results, as they are the most valuable contribution of this thesis. Finally, the results are concluded and discussed in chapter five.

2. THEORETICAL FRAMEWORK

The theoretical framework of the thesis consists of three parts. First, we explore the futures research of higher education in preparation for the Delphi research described in the next chapter and for defining a digital campus. The second subchapter explores the definition of a digital campus in a Finnish context. The third and last subchapter describes communities of practice, a modern pedagogical approach which is utilized for evaluating the predicted changes in teaching.

2.1 Higher education futures research

Futures research regarding higher education seems to not be among the most popular fields of study. An extensive amount of research has been conducted in the recent decades but as futures research tends not to predict the future for a longer period of time than 30 years and usually less, much of the research have already had their "expiration date". The rapid pace of technological development is also a factor reducing the present day relevance of research conducted 15 years ago or more.

Survival of formal tertiary education seems to not be obvious in the digital era as highlighted by for example Barber et al. (2013), Dator (1998) and Tirronen (2015). Futures research, policy papers, white papers and other relevant documents aimed at transforming the HE to the digital era base their views and suggestions on different sets of changes in the operational environment. Change in itself is not valuable but needs to be based on demands of current or future changes in the operational environment. A common element in predicting changes in the operational environment is the increasing role of technology in HE. The researchers are very unanimous in the subject since there were no exceptions in the literature utilized in this thesis. Other changes in operational environment presented in the literature and specifics of digitalization that should be accounted for in planning the digital campus of Tampere3 are presented in this subchapter.

2.1.1 Holistic research on higher education systems

International public organizations such as OECD and European Commission have relatively recently published their own research on higher education futures. The OECD Centre for Educational Research and Innovation (CERI) conducted a research project known as University Futures around mid-2000s which aimed to "inform and facilitate strategic change to be made by government decision-makers and other key stakeholders in higher education". (CERI/OECD, n.d.)

One of the publications of University Futures project is a scenario analysis Four Future Scenarios for Higher Education". The first scenario is 'Open Networking' which describes the global trend of HE as very internationalized and interconnected. The model stresses collaboration over competition and collaboration between HEIs and society outside of HE sector as well. The second scenario, 'Serving Local Communities', stresses the regional and local role of HEIs. A major part of the funding comes from local industry and research is more oriented to serving the local economy. The third scenario known as 'New Public Responsibility' highlights the role of New Public Management in higher education with stronger financial incentives, centralized leadership and responding to the needs of market. The boundaries between private and public institutions are blurred and institutions are heavily accountable to their funders. The fourth and last scenario is 'Higher Education Inc.' which describes a future where higher education and research institutions compete in a global market on commercial basis. Institutions focus heavily on either teaching or research depending on their strengths and division of labor between institutions is transforming to international scale. (CERI/OECD 2008)

Vincent-Lancrin (2004) has conducted research that yielded six scenarios which were later utilized in the University Futures project. The scenarios are based on six variables: type of population covered by tertiary education, nature of funding, integration of missions, international dimension, homogeneity of status of faculty and institutions, and the degree of harnessing of technology. The resulting scenarios are presented in a matrix (figure 2) of type of learning and width of institutions offering HE degrees. Scenario 1, Tradition, is based on HE sector continuing business as usual. The second scenario labeled as Entrepreneurial is much like scenario 1 with the exception of funding model developing to a broader variety of funding sources including private funding compared to current situation. Third scenario known as Free market differs from scenario 2 by its funding model which consists mostly of private funding and by its missions of HEIs which are more diverse with HEIs having a possibility to specialize in choosing their balance between research and education, fields of science, audience etc. The fourth scenario is Lifelong learning and open education where universities are characterized by universal access for all age groups and much less focus on research. Universal access is emphasized with enhanced possibilities of flexible learning enabled by technology. Scenario 5 is named Global network of institutions which describes a future where tertiary education is transformed especially by increase in collaboration with other institutions including the private sector and the possibility of students to build their own degree from global, mostly digital offerings. The sixth and final scenario is Diversity of recognized learning – Disappearance of universities in which formal tertiary education no longer exists. Learning happens throughout life in various ways and for various reasons. Technology is a major factor in enabling the transformation. It is notable in the scope of this research that in all scenarios except scenario 1 the role of technology is considered to increase in the future. (Vincent-Lancrin 2004)

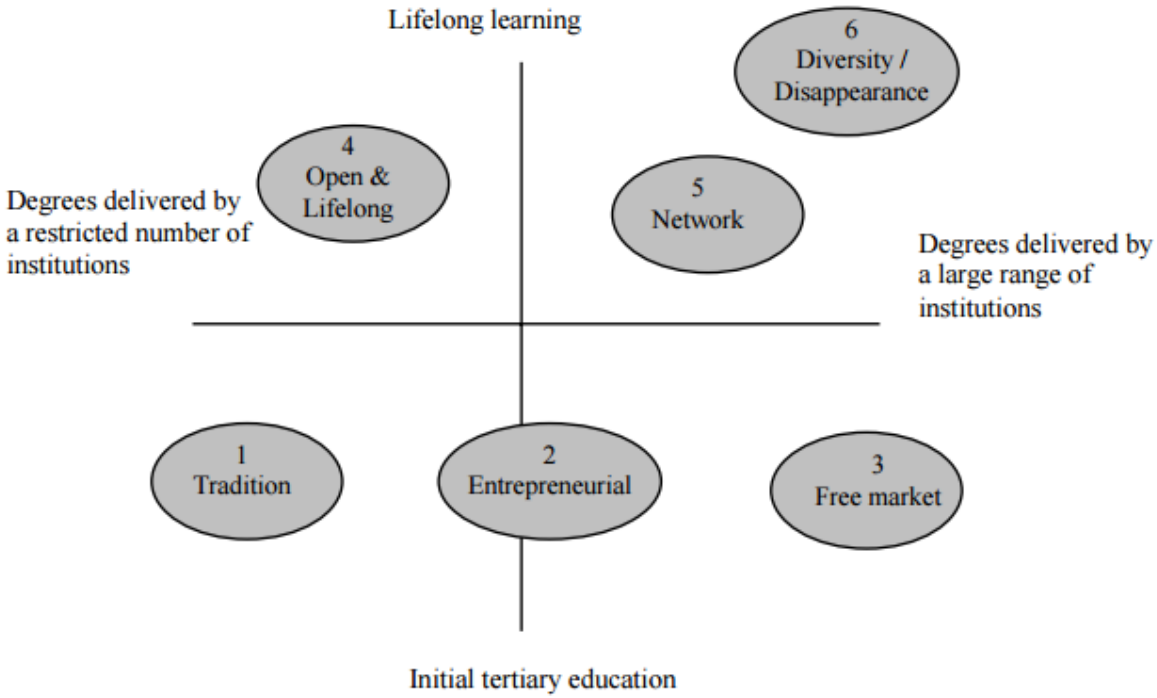

Figure 2. *Six scenarios for university futures. Source: OECD/CERI 2004*

Another OECD/CERI publication on university futures has been made by Atkins (2005) highlighting the role of new and emerging technologies in learning, teaching and research in HE. Regarding the concrete digital tools he underlines the role of computational simulation, big data, VR and AR and new genres of multimedia as disruptive tools in transforming HE. On a more general note Atkins stresses the significance of decreasing relevance of time and distance, new paths of research and learning enabled by technology and comprehensive access to information. A number of possible issues and possibilities regarding digitalization of HE are also presented.

The European Commission has also partaken in the university futures research with an expert group focusing on the subject in the early-2000s. The report "STRATA-ETAN expert group on foresight for the development of higher education/research relations" and the work behind it was conducted to investigate options to support European collaboration in HE/R futures research. The research especially highlights the relationship of higher education and research on the whole sectors which also included other institutions than universities. The main issues regarding the subject included rise of globalization and market forces, rise of knowledge society, trends in demography and confidence crisis in science and education. Main challenges recognized include increase in student numbers, increasingly diversified student population, increase in competition for students and student consumerism, more responsiveness to market demands in both education and research, diversification and differentiation of agents and functions, threat to social cohesion in access and academic achievement, pressure to accountability, and more competition for HE/R staff. (Bourgeois 2002)

After analyzing these variables of the operational environment the expert group formed three scenarios for the future of HE/R in Europe. The first scenario known as “Melting Pot” where the HE/R system is quite similar compared to present day producing both private and public goods. The scenario is characterized as difficult to manage in the long run and is predicted to come true if policy-makers take a “laissez-faire” attitude towards the trends affecting the operational environment. The second scenario is known as “Market Triumph” where market forces are dominant resulting to privatization and marketization of HE/R. It is recognized as the most likely scenario if an active adjustment attitude towards governance of HE/R is taken by the policy makers which consists of acknowledging the observed trends, anticipating the near future and altering policies based on these. The third scenario known as “Creative Society” requires a more proactive attitude to materialize which requires the HE/R system to also alter itself from the inside in addition to policy makers. In this scenario public HEIs are only responsible for the basic HE with continuous education being on the private sectors responsibility as it is seen as only benefitting companies. The same mindset applies to research in which public institutions mostly contribute to basic scientific research in a holistic and interdisciplinary perspective. (Bourgeois 2002)

Researching the current state and predicting the next decade of European HE, the Trends 2015 report focuses especially in teaching and learning. The report includes extensive survey data on European universities regarding especially the theme of the report. The report highlights four clusters of issues that need to be especially accounted for in the next decade to for the universities to prosper. The first issue is the adaptation of teaching and learning to fit the needs of a diverse and multicultural student body with focus on student-centered learning and employability of graduates. The second issue regards organizational structures and human resources underlining the need for harnessing organizational structures and digitalization to support teaching and learning and committing to staff development. The third issue is the growth of marketization in HE which can blur the dividing line between public and private HE. The fourth and last issue discussed is the common European agenda for HE policy highlighting the strategic importance of European Higher Education Area (EHEA). (Sursock 2015)

In addition to HE futures research conducted by public institutions and the HE sector researching itself, the private and third sector also have interests in having an impact in the future of education. A global education company Pearson presents the views of the authors on how HEIs should adapt to survive in the digital era. They identifiy three major challenges in the operational environment for HE systems in a global scale: ensuring employability, breaking the link between cost and quality and changes required in learning ecosystem to support alternative providers and the future of work. (Barber, Donnelly & Rizvi 2013)

A consulting company Ernst & Young has conducted a report on futures of universities in an Australian context. The key drivers of change identified include democratization of

knowledge and access, contestability of markets and funding, digitalization, global mobility and integration with industry. These drivers of change were utilized to form three scenarios: streamlined status quo; niche dominators; and transformers based on background variables of customers, product offerings, disciples, sales, delivery, student services and back office. (Bokor, 2012)

A Finnish professional and labor market organization Academic Engineers and Architects in Finland – TEK has published Finnish engineering education futures research conducted by Korhonen-Yrjänheikki (2011). The research investigates how Finnish engineering HE should be developed to be future-proof and stresses collaborative efforts in both internal and external institutional levels in the conclusions.

2.1.2 Futures research on educational aspects

Futures studies regarding the **educational** mission of HEIs have been conducted to a large extent. Much of the research completely ignores research, mostly because it is not part of the missions of all HEIs in all HE systems. Education is naturally always a core mission when discussing of HEIs.

Risto Linturi, Osmo Kuusi and Toni Ahlqvist (2013) have conducted a research predicting 100 radical technologies of the future in 2013 ordered by the Finnish parliaments future committee. One of the hundred radical technologies is the increase on one-to-one teaching and guidance. On a national level, education employs around 200 000 people in Finland alone and transfer of skills, knowledge and competences traditionally takes place in a physical environment that emphasizes the need for building and upkeeping physical infrastructures and requires around half a billion transfers of people. Teaching bound to a physical structure is recognized as a very ineffective method especially regarding the need to constantly update the curriculum. Teachers have a very limited amount of time to focus on a single student and students do not have a chance to choose a studying method best suited for themselves or to learn in a pace best suited for themselves.

The solution suggested by Linturi, Kuusi and Ahlqvist is the utilization of digital solutions including online lectures, gamification of learning and computer or robot assisted exercises combined with human assistance and guidance when necessary. Peer learning and student discussions are a natural part of learning with project based learning. On-the-job learning is supported by virtual reality and remotely controlled robots. Assessment of learning is temporary for competences, skills and knowledge that outdate quickly. The technology required has to a large portion already matured and time and place have less and less importance as technology develops further. A threat identified with the increase of distance learning is the disappearance of local cultures and shared identity. The biggest hindrance in advancing the change is seen to be the inertia of educational institutions.

The Higher Education Funding Council of England (HEFCE) has conducted a research on the higher education workforce in the future targeting approximately 2035. Even though the analysis is made specifically for the case of Great Britain, most of the content can be generalized to other nations as well. The five-scenario model derived from the research is based on six major trend analyses: economic, demographic, social and political, educational, business process and futures analysis. The underlying assumptions that are taken in account but are expected to have little overall effect on HE system include fewer international students, some fluctuation on number of students attending HE, high penetration of digitalization in education, little to no effect from democratization and the increasing role of media. The derived scenarios include:

- **Leading knowledge creation**. Universities provide somewhat elite education and focus on postgraduate education while undergraduate education is mostly produced with work-based transferable modules of learning.
- **Responsive knowledge creation**. Higher education is crudely split to dual system of applied and academic education with both providing all levels of degree. The division is based on the disciplines with professional or vocational education being provided in the institutions providing applied education. Research is mostly harnessed to manufacture innovations for private sector.
- **Regional conglomerates**. The scenario focuses on funding cuts of HEIs resulting to attempts in saving administrative costs of by means of economies of scale. Institutional identity is replaced by regional identity as the HEIs form regional conglomerates.
- **No government funding**. This scenario is regarded as being closest to 'business as usual' type of scenario with the recession of economy continuing and government prioritizing pre-tertiary education in funding. It results to a small, privatized sector of HE with funding from private sector. Students can mostly only attend part-time as the heavy tuition fees require working while studying.
- **Total government funding**. This scenario starts with a similar setting as the previous but a radical change in funding is done about 10 years to the future leading to a robust HE sector by 2035. Participation rate is high and studying offerings are very flexible. The career paths in HEIs are diverse for different interests. (Boxal & Lambert 2009)

Dator (1998) presents some challenges of HE futures of the time that are still relevant today. He emphasizes that learning is likely be relevant also in the future, but formal teaching through a publicly-mandated institutions are a fragile concept as they rely heavily on physical structures and locations. Dator visions some possible futures for HE including a heavy increase in virtual education, end of academic freedom and the need to enhance service experience for HEIs to remain interesting.

On quite similar notes regarding the physical campus, Nadin (2009) also predicts an end to the 'traditional' universities relying heavily on physical campuses and stresses the importance of VR in future education. Abeles (2001) suggests that the role of physical campuses might transform to serve new purposes such as business incubation and independent facilities for private research and institutions. Haggans (2015) stresses that physical campuses must provide values that are unavailable by other means to be justified and suggests that HEIs will need to act as their survival was at stake to succeed in the transformation.

Abeles (2001) also highlights the disruptiveness of digitalization and especially internet in destroying the hegemony of time, place and content of higher education. He underlines the global outreach of online education and the unnecessity of institutions in digital era. HEIs need to ne reinvented to match the needs of chancing labor market regarding both graduates and continuing education. The skills, competences and knowledge provided by HE and profiling of HEIs are key issues in developing a future proof HE system.

New Media Consortium and EDUCAUSE have conducted a joint research project in 2013 predicting the near future educational trends regarding utilization of technology. The technologies expected to have a major impact in near future higher education include: MOOCs and tablet computing by 2014; games and gamification and learning analytics by 2016; 3D printing and wearable technology (especially VR and AR solutions) by 2018. (Johnson, Adams Becker, Cummins, Estrada, Freeman & Ludgate 2013).

In a feature on Nature, M. Mitchell Waldrop visions the effects digitalization and especially MOOCs might have on HE. According to the MIT professor Chris Dede universities mostly position themselves on operating in the university business, when they should actually position themselves on the learning business. Universities need to radically reshape their structures and practices to harness the full potential of technology.

The higher education futures trends presented above is utilized in the Delphi research described later in the thesis. The futures trends will also be combined with exploration of Finnish HE in the next subchapter to derive a definition for digital campus in a Finnish context.

2.2 Digital campus

A campus can be defined in a variety of ways. The online dictionary of Merriam-Webster provides following definitions for a campus:

1. the grounds and buildings of a university, college, or school
2. a university, college, or school viewed as an academic, social, or spiritual entity
3. grounds that resemble a campus *<a hospital campus> <a landscaped corporate campus>* (Merriam-Webster)

Both definitions 1 and 2 are highly relevant in the context of this thesis. Regarding the first definition, the campus of a HEI naturally includes the physical infrastructure in which the activities of a HEI are organized. Regarding the second definition, in Finnish context the social or academic entity is also a very important aspect of a HEIs. The social entity is a central part of legislation of HE and is visible in how the HEIs are organized. As the technological possibilities have developed, the social entity is no longer bound to a physical space and therefore the digital infrastructure should also be included in defining a HEI campus.

This chapter examines the nature and characteristics of a Finnish HEI campus from many perspectives to define a digital campus in a national context. The perspectives are mostly derived from governance and steering of HEIs which should reflect the Finnish culture.

2.2.1 Missions of Finnish higher education institutions

Finnish HEIs have three major missions: teaching, research and societal impact. The type of missions varies a bit between the two different types of HEIs. First, universities are required to provide research-based education while the education provided by UASs is more vocationally oriented. Second, the research in universities is required to be internationally high level research while UASs are demanded to serve the regional needs with applied research. The division of labor in societal impact assigns the responsibility of regional needs to UASs with universities serving a broader part of the society. (Yliopistolaki, Ammattikorkeakoululaki) The societal impact mission is described in more detail in the next section.

Besides the missions of HEIs listed in the Universities Act and Polytechnics Act, the Ministry of Education and Culture steers HEIs to a range of other actions. Until 2016 Finnish education has been steered with a medium-term plan of which the latest highlighted for example the role of HE in internationalization, commercialization of innovations and providing adequate labor force quickly and effectively to the labor market. (OKM 2012) Finnish HE is now steered with a more strategic approach that in the current four-year term of office will especially focus on for example collaboration of private sector and HEIs, internationality of HE and impact of research and innovations. (OKM 2015)

Finnish HE system also emphasizes quality in carrying out the missions of HEIs. Both universities and UASs are required to partake in a review of their quality systems regularly. (Yliopistolaki, Ammattikorkeakoululaki)

The steering method of Finnish HE is very funding-oriented. The funding for HEIs is shared on the basis of funding models with both HEI types having their own model. The funding models emphasize especially teaching and research from the perspectives of societal impact, quality and internationality. In addition to the funding models, the Ministry

of Education and Culture provides strategic funding to achieve national-level policy goals. (OKM 2015)

2.2.2 Societal impact

The amount of public funding is very high in Finnish HE system with around 98 % of funding coming from various channels of public funding. (Yliopistojen talous, Education statistics Finland Vipunen) This sets high demands and expectations on broadening the societal impact of HEIs in a variety of ways.

One aspect of societal impact is the promotion of collaboration between HEIs and the private sector. It has been a high priority policy in Finnish education policy for some time and is especially highlighted with the current government by allocating strategic funding to enhance HEI cooperation with the private sector. (Hallitusohjelman toteutus kärki-hanke 5, valtioneuvosto 2016) The aim is to enhance the transfer of knowledge to boost innovations and thereby boost the national economy.

Another aspect regarding societal impact is the HEI's interaction with society outside of the academic community. The campuses of HEIs are public spaces which could be utilized also by users outside of university community and companies. Aiming for higher utilization rate of public spaces has been a trend for some time. (Tekes) The HEI libraries are also expensive public services that has potential for wider societal impact.

One more aspect of social impact that should to be mentioned is the openness and accessibility of data. Open data is also one of the high priority policies of Finnish higher education with the Ministry of Education and Culture currently steering a project to enhance open science and research of Finnish HEIs. The aim of the project is to enhance the quality, competitiveness and impact of science and research. (avointiede.fi)

2.2.3 Academic community in Finnish higher education

The Finnish legislation includes a notion of what comprises a membership in a university community. According to the Universities Act, the teaching and research personnel, other staff and students comprise the university community i.e. the Finnish university community is formed by all staff and students that are employed by or studying in the university. (Universities Act 2009)

The university community has a big role in the administration of the university. Finland has two types of universities, public universities and foundation universities. In the public universities, all levels of administration have a representation of the three university community groups: the professors, other teaching and research staff and other staff, and students. The other types of universities, foundations universities, have a representation of the three university community groups in all levels of academic administration but unlike

in the public universities, the university board is not required to have representatives of the university community. (Universities Act 2009)

The other type of Finnish HEIs, universities of applied sciences, or as defined in the legislation, polytechnics, also have a definition for the HEI community known as polytechnics community. The Polytechnics Act states that teachers, other staff and students of a polytechnic form the polytechnics community, i.e. once again the HEI community is formed by all staff and students that are employed by or studying in the HEI. (Ammattikorkeakoululaki)

As in universities, universities of applied sciences also have representation of the HEI community in the administration. The board of a university of applied sciences has one member elected from the staff of the HEI and one member from the students of HEI. (Ammattikorkeakoululaki)

2.2.4 Defining a digital campus

So what then should account for a digital campus? As a conventional campus includes the physical infrastructure of a HEI, the digital campus should naturally from around the digital infrastructure of a HEI. The digital infrastructure is however only the enabler of digitalization of operations. Teaching, research and societal impact should naturally be included in defining a digital campus as they are part of the missions of HEIs. As discussed, Finnish HEIs have various functions in addition to the official missions stated in the legislation which requires the definition to be broader than only the missions of HEIs.

The missions of HEIs however limit the actions and services a university can provide. As the funding mostly comes from public sources, the operations that money can be used on is regulated. All operations of HEIs can be connected to the missions, especially with societal impact mission being open to various interpretations. All operations of HEIs are therefore assumed to be relevant to functions of HE system. Digitalization of the operations provides various advantages as described in chapter 1.

To summarize, the definition of a digital campus in the context of this thesis is as follows:

> *A digital campus consists of all the digitized operations that a higher education institution provides and of the infrastructure required to run the digitized operations.*

As the aim of the thesis is predicting the relevant characteristics of a digital campus in 2030 we will next explore some features that need to be taken into account in predicting the future digital campus.

2.2.5 Predicting a digital campus in 2030

With a digital campus consisting from a combination of digitalization of HEI missions and academic communality, a digital campus is a very broad concept. This sets some challenges to the research of digitalization of higher education. If the digital campus consists of supporting all actions, services and physical infrastructure of a HEI, any changes in the operational environment can have a great deal of dynamic effects on how the digital campus should be developed. These include for example:

1. **Financing of higher education:** how will the amount of financing for higher education develop and where will the financing come from?
2. **Level of education:** what percentage of the Finnish population should attend higher education in 2030?
3. **Development of technology:** will disruptive technologies emerge regarding higher education? What kind of possibilities would e.g. utilization of virtual reality, augmented reality, big data and learning analytics provide to higher education? Will there still be a need for a physical campus in 2030?
4. **Globalization of higher education:** how will the globalization of higher education affect the demand and supply of higher education? How can we succeed in the global education market? What will be the main languages of education in 2030?
5. **Amount and availability of information:** how will the availability and accessibility of information develop? How will big data affect the development of higher education institutions?
6. **Changes in the labor market:** what kind of skills, competences and knowledge should higher education provide towards 2030?
7. **Service experience:** what kind of demands does globalization of higher education set to service experience in our higher education institutions?
8. **Political governance:** how will the autonomy of higher education institutions develop? Will political governance help of prevent the necessary changes in higher education?
9. **Internationality:** how will the internationalization and international cooperation of higher education institutions develop towards 2030?
10. **Academic work:** will there be freedom of research in 2030? How will universities develop as workplaces?

The list above is by no means a complete description of relevant concepts. For example, the demographic changes could play a crucial role in how the future of higher education plays out as climate change can cause migration of peoples also affecting the Finnish HE system. However, all possible factors cannot be predicted and accounted for in the research to keep the amount of burden manageable.

2.3 Communities of practice

Community of practice (CoP) is a theory of learning that combines experiential learning, social constructivism and connectivism. (Bates 2015) As learning environments, CoPs are student-centered. (Land, Hannafin & Oliver 2012) Its origin is usually attributed to a book on situated learning by Lave & Wenger (1991). CoP theory emerged from researching traditional craft apprentices and underlines learning that is contextual and highly interactive. CoP derive from a master-apprentice model in a way that newcomers have a legitimate access to a practice and learn from old-timers and transform to old-timers themselves when they have learned enough. Both the newcomers and old-timers learn as a result of their membership in the community. (Lave & Wenger 1991)

In a more formal note, Wenger-Trayner (2015) have defined CoP as follows:

> *Communities of practice are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly.*

The definition is quite similar to some other relevant social learning theories such as a knowledge-building community, knowledge networks and communities of interest. The concepts can be somewhat overlapping as for example a knowledge-building constitutes a community of practice when it is formed and operational. (Hoadley & Kilner 2005) CoP in itself may also have varying definitions depending on the use, including for example feature-based and process-based definitions. (Hoadley 2012)

To describe CoP in more detail, Wenger (2000) has identified three central characteristics of a community of practice:

- **domain**: a common interest that connects and holds together the community
- **community**: a community is bound by the shared activities they pursue (for example, meetings, discussions) around their common domain
- **practice:** members of a community of practice are practitioners; what they do informs their participation in the community; and what they learn from the community affects what they do.

Modern learning theories emphasize communities as a platform of learning. A more primal understanding of learning centered around knowledge transfer between individuals, which is quite visible in how classrooms and lecture halls have been designed and in the type of education most of us have received. Modern learning theories include behaviorist learning, developmental learning, cognitive learning and sociocultural learning. Communities can provide opportunities in learning regardless of the selection of theory. (Hoadley & Kilner 2005)

A central characteristic of a community of practice is the possibility for a process of legitimate peripheral participation. It is a process of newcomers becoming experienced members and eventually old timers in a community of practice. (Lave & Wenger 1991) Through the process the members identify themselves as members of the community. CoP typically have a degree of informality and high connectivity. (Hoadley 2012)

Even though CoP is essentially a learning theory, it is utilized very widely outside of learning institutions. It has transformed to a somewhat popular organizational practice on knowledge management. Besides educational organizations, applications of CoPs have been actively used in private and public sectors, other types of organizations and for various purposes such as knowledge management where the learning aspect is only a means to an end. (Wenger-Trayner 2015, Pan & Leidner 2003, Ardichvili 2008)

2.3.1 Technology and communities of practice

Technology has played a central role in the theory of CoP since the beginning as the early developers of the theory had a background in knowledge management. The possibilities of new kinds of platforms to support CoP have developed in the last decades especially with the technology enabling more and more time and place independent communication. Technology can support both the community and practice characteristics of CoP. For example a web-based modelling platform for engineering students would be a technology supporting the practice and a social media type of communications would be a technology supporting the communality aspect. (Hoadley 2012) If a HEI aims to develop their institutional pedagogy towards a community of practice type of education, the technological procurements should be such that they support the forementioned aspects. Hoadley (2012) presents four techniques for harnessing technology to promote CoP in teaching. The techniques target four areas: content, conversation, connections and information context.

Supporting connections can be done by linking people with others that have similar practices. The platform for connections can be open or closed with the latter being more frequent in traditional institutional education. For example a facebook group or a Moodle page with a forum sets an adequate infrastructure for enhancing connections, but naturally does not necessarily in itself motivate participants to converse. In a more informal setting the platform could be an open facebook group for people interested in electrical engineering in which information is shared and discussed.

The support for content can be done with a shared repository of information resources. The knowledge of the members of community is one sort of knowledge repository in itself, but supporting it with a technological solution could be for example a wiki or similar platform where the members can share references and drafts of papers and have access to each other’s work.

Probably the most common technological support for CoP comes in some form of conversation platform. Most studying-related platforms support this feature already today. The form of the platform can alter from a virtual reality type of space like second life to a simple bulletin board attached to the Moodle page of a course.

Providing awareness of information context is the fourth presented technique to enhance CoP type of learning with technology. It can be for example an information repository of what books have been studied by other members of the community to learn about the subject. A more sophisticated solution could be utilization of learning analytics to provide information on how others have learned and with what kind of material.

A consultation company Urgent VC LLC has illustrated a somewhat modern digital toolbox for supporting COPs (figure 3). The figure is a revision of a prior work from 2001 of Etienne Wenger. As new digital platforms are born every day the list is in no way complete, but many of the provided platform examples are still relevant today six years from the origin of the revised picture.

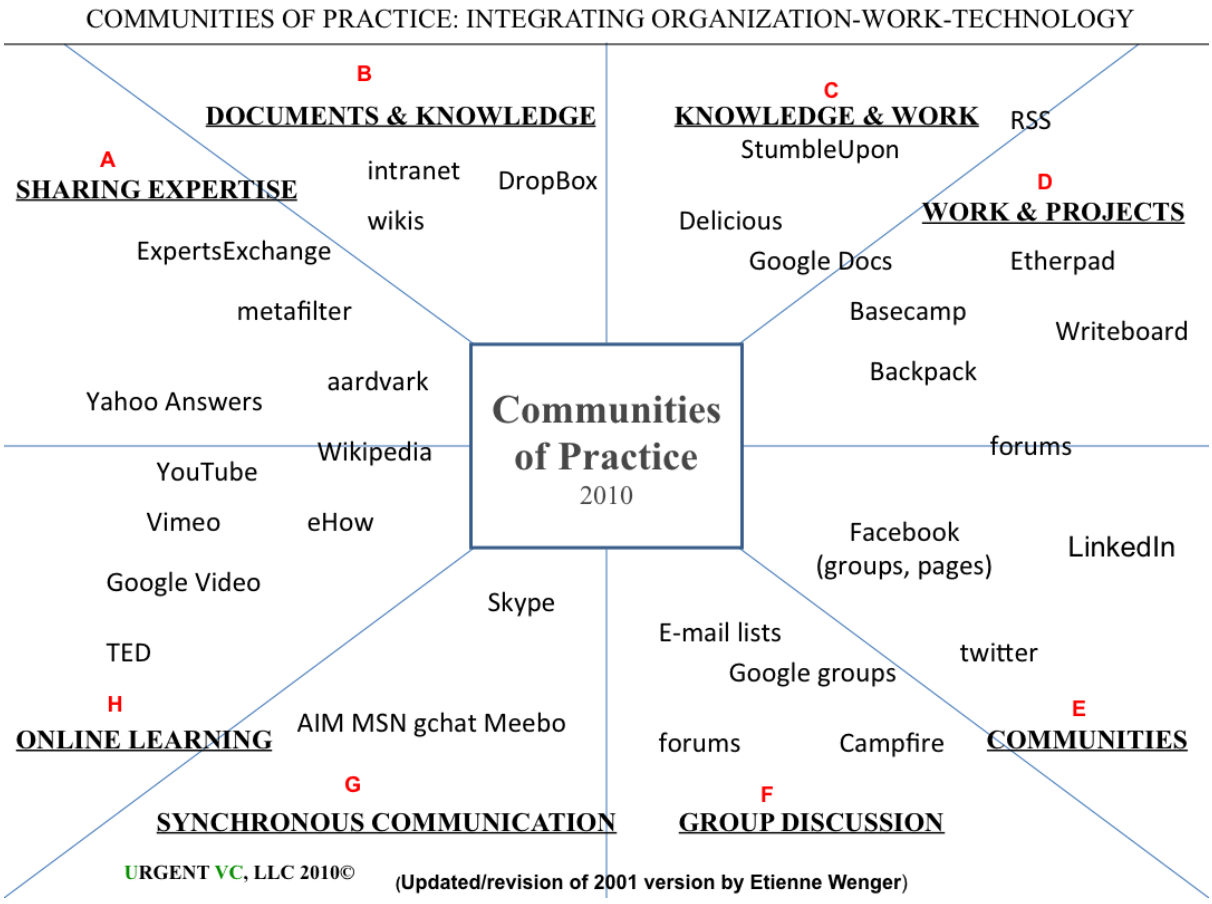

Figure 3. *Examples of technological solutions for communities of practice in 2010. Source: Urgent VC LLC (2012)*

Lewis & Rush (2013) have researched a case of using microblogging tool twitter as a platform for developing a CoP. The researchers created a personal network of practice to

interact with other users that have similar interests which in the context of the research was digital stewards in HE. Although the setting did not after all meet all the requirements of a CoP, twitter is shown to be a useful tool for professional development and use of technology in teaching.

The relationship between knowledge management and CoP are strong as Lave & Wenger that have coined the term have a background on knowledge management. A research regarding creation of a multi-national organization's knowledge management system with CoP has been conducted by Pan & Leidner (2003). The role of CoP in strategic knowledge management is highlighted due to its ability to foster both individual and collective knowledge and both explicit and tacit knowledge. The case examines an intranet-based knowledge management system developed for the organization and its effects on knowledge management. The research highlights the possibilities of technology for creating worldwide, mega-sized communities and the necessity to consolidate knowledge sharing processes and technologies.

Ardichvili (2008) explores motivational factors, barriers, enablers and supporting participation in virtual COPs (VCOP). The research does not focus on any specific application or technology per se but investigates aspects of participation in VCoPs in general. The enablers for sharing knowledge in VCoPs include organizational culture, trust and supporting tools of which the latter is relevant to the aspect of technology. The research highlights that instead of treating technology as just a tool it should be viewed as something that has an important influence on the identity, character and patterns of behavior of the community.

2.3.2 Tampere3 and communities of practice in 2030

What makes CoP so interesting in the scope of this thesis? CoPs were selected as a point of view for a variety of reasons. First, academic communality is considered very important in Finnish HE as described in the previous subchapter. CoPs would provide a concrete practice in deepening the academic communality while also enhancing learning. Second, as noted in the first chapter, Finnish HE has not changed much in the recent decades despite the possibilities enabled by development of pedagogy and technology. It is therefore very interesting to speculate what the mindsets of Tampere3 community members and of external stakeholders are on forecasting the educational setting in 2030. Third, CoPs have been from the start very closely linked to possibilities of utilizing technology to enhance learning which fits the theme of the thesis. Fourth, as the researcher is not very familiar and not formally trained in pedagogy, it is most likely wise to take a somewhat narrow perspective in the pedagogical aspect of theoretical framework.

In this thesis, CoP in future Tampere3 will be studied from three perspectives: communities of practice formed within staff of Tampere3, within students of Tampere3 and be-

tween staff and students of Tampere3. The premise is that CoP type of teaching and learning will increase inside and between all groups as technology is harnessed to enable legitimate peripheral participation where it would before have required human resources.

3. METHODOLOGY

This research is mostly based on a futures research method Policy Delphi from which most of the material has been acquired. A small part of the material has been acquired from workshops on digitalization of higher education organized as part of the Tampere3 process due to the themes of the workshops being very relevant to the theme of this study. The results of Delphi and the workshops are analyzed separately. The Delphi technique and analysis of the workshops are described in more detail in this chapter.

3.1 The Delphi method

Delphi method is a futures research method oriented by researchers of RAND corporation in the 1950s and was originally utilized in researching development of military related technology. In the early days of the method it was mostly utilized for generally predicting the development of technology but has since spread to numerous other applications. In the early 2000s the method was actually very extensively used for educational policy research. (Kuusi 2002)

In their book The Delphi Method Techniques and Applications (1975) Linstone & Turoff define Delphi as follows:

> *Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem.*

The method is based on selecting a panel of experts to act as "Delphi oracles" to make predictions about the future. Expertise is however an ambiguous concept as described in more detail further in the chapter. Amount and type of participants in a Delphi research vary with the aims of the research. A Delphi panel size can vary between around ten and thousands of panelists. (Kuusi 2002, Rotondi & Gustafson 1996)

Since the origin of the first type of Delphi technique which is often referred to as a Conventional Delphi many other variations of the technique have emerged. But regardless of the Delphi type, three distinct characteristics can be identified as argued by Woudenberg (1991):

1. **Anonymity**. Delphi aims to create a group forecast while keeping the group dynamics to a minimum. (Metcalfe 1995) The social or hierarchical statuses of panelists is prevented to affect the group forecast by means of anonymity. (Kuusi 2002) The possible problems of social or hierarchical statuses include for example domineering personalities taking over the conversation, unwillingness of individuals to take a stand on an issue before knowing where the majority is headed,

difficulty of publicly contradicting individuals in higher positions, unwillingness to abandon a position once it is publicly taken and fear of bringing up an idea that might turn out to be bad resulting to loss of face.

2. **Iteration**. The research has several rounds to ensure that all relevant arguments can be presented. The first round can be inventory in which the expert panel can provide events or parameters to be estimated. The number of rounds can be fixed in advance or depend on when the goal of the research is achieved, for example consensus among panelists.
3. **Feedback**. The results of a previous round are fed back to the panelists to create discussion among the panelists in form of arguments. The panelists also have a chance to re-evaluate their arguments and quantitative estimates based on the feedback.

Delphi is a very versatile and flexible method. The characteristics described above always need to be accounted for but the details of research practice can be organized as best fit for the research at hand. A Delphi research usually undergoes four distinct phases. The first phase is the exploration of subject under research in which the panelists partaking in Delphi provide any additional information regarding the subject they feel relevant. The second phase consists of exploring how the views of panelists differ on the issues under discussion. The third phase is based on exploring the underlying reasons for possible disagreements from the second phase. The final phase of Delphi is an iteration of all the previously gathered material where all relevant information is sent back to the panelists' review and enabling changing their mind based on the new information. (Linstone & Turoff 1975)

The epistemology of Delphi has been widely studied. (Kuusi 1999, Linstone & Turoff 1975, Futures research has two distinct characteristics that are important in exploring its epistemology. First, futures research is of a multidisciplinary nature. Second, the epistemology of futures research differs from other disciplines as the future does not yet exist and cannot be studied directly. (Korhonen-Yrjänheikki 2011) The norms, dogmas, beliefs, revelations, authorities and intuition all have a role in shaping the future because they affect the decision makers and are also important explanations of the past. The nature of future is unfinished but if the unfinished nature should make an anticipation unscientific, explanations of the past made by historians are also unscientific. (Kuusi 1999)

Delphi is often associated as a method of achieving consensus. This is a persistent misperception highlighted for example by Linstone & Turoff (2010) and Kuusi (1999). Linstone and Turoff underline that Delphi is a method for structuring a group communication process instead of aiming for producing consensus. The multi-round structure of Delphi is targets achieving stability in production of relevant arguments instead of achieving consensus. Bipolar distribution is in fact a very welcome situation as it is usually a very fruitful result in producing arguments. The aim of not achieving consensus is actually one of the major differences in Delphi and a traditional committee work.

Different variations of Delphi include for example Conventional Delphi, Policy Delphi, Decision Delphi, On-Site Conferencing and Research, Qualitative Controlled Feedback, Imen-Delphi and Argument Delphi. (Passig 1998) The variant utilized in this research is Policy Delphi which is described in more detail in the next section.

3.1.1 Examples of Delphi in higher education research

Variations of Delphi method have been widely utilized in developing educational policies. Examples of Delphi method uses for educational purposes include curriculum development, future of adult education, nurse education, institutional planning, determining educational effectiveness, distance education, identifying competencies and vocational training to name a few. (Clayton 1997) Even though the research subjects are all questions of *policy*, Policy Delphi is not necessarily the utilized method.

The use of Delphi in educational technology research has been studied by Nworie (2011) by comparing some notable research on the field. Nworie compares research on the subject from the perspective of several themes including identifying roles and responsibilities, determining competency levels, determining areas of practice and importance, leadership, technology use and predicting the future. The article concludes on a note that Delphi technique is applicable to a broad spectrum of needs and challenges.

Green (2014) has conducted a study of use of Delphi in an educational setting in a more general level. On the basis of the data a list of elements in interpreting a Delphi study in an educational setting was comprised.

1. *Campus environment.* The whole academic community should be involved in the process when planning and implementing guidelines and services.
2. *Consensus.* If consensus is not achieved naturally in the Delphi technique, the "consensus" can be reached by mathematical means with for example mode or median.
3. *Focus groups or survey data.* The results of Delphi should be weighed against user experience data from the campus.
4. *Institutional research.* Institutional research is another useful object of comparison for the Delphi data.
5. *Instructional design principles.* Taking instructional design principles into account in implementation of results ensures a smooth transition.
6. *Prior research.* The Delphi results should be checked against prior research and discrepancies should be investigated further.

Korhonen-Yrjänheikki (2011) utilized an Argument Delphi method to research the future of Finnish engineering education. The aim of the research was to predict the future needs of society regarding engineering education. The expert panel consisted of policymakers, presidents of universities and polytechnics, top management of the industry and top management of research organizations. The research produced four future scenarios 'New

parallel model', 'Parallel in theory – overlapping in practice', 'Return to the old parallel model' and 'All higher education institutions become universities' for the evaluation of panelists and for further use of decision makers. All of the scenarios highlighted the role of the Finnish dual HE system in the future of engineering education with different settings.

3.1.2 The Policy Delphi

Even though Delphi was originally mostly utilized as a technology forecasting method consisting of a homogenous panel of experts, many variations have since evolved with different goals. One of the variants is the Policy Delphi which stresses the value of Delphi as a structured communications system for policy issues. The Policy Delphi mainly revolves around producing the strongest possible opposing views regarding policy decisions.

The Policy Delphi, as the name suggests, is best suited for problems with no single right answers such as goal formation on a policy issue. When dealing with a policy issue, systems analysis, operations research and other relevant disciplines can only supply a factual basis for advocacy. The issues under research would cease to be issues of political nature if there was a comprehensive analytical or quantifiable solution. While Delphi is based on an expert group panel, there are no overall experts regarding policy issues, only advocates and referees. (Linstone & Turoff 1975)

The result of a Policy Delphi should account for the often conflicting values of different interest groups. This affects the selection of panelists in a Policy Delphi research. The Policy Delphi is not a replacement for political decision making or work preceding the decision making such as committee work, but instead should be viewed as a supplement for the previous providing organized views of the panelists. (Linstone & Turoff 1975)

The Policy Delphi was originally an especially valued tool for public sector but is also fitted for other types of organizations that wish to involve a wider perspective to decision making. A premise for a Policy Delphi is that the decision maker does not want a committee making a decision but instead to have a group of experts representing different interest groups providing all the options and relevant arguments to support the decision making. Not seeking a consensus as a result of the method provides some freedom on the selection of the panelists and details on the structure of Delphi. (Linstone & Turoff 1975) Not seeking a consensus however also sets some new limitations to the structure and selection of panelists with the aim being on providing as much information as possible to the decision makers.

3.1.3 Key to success in utilization of Delphi

Kuusi (2002) has listed some requirements for a successful Delphi research:

- Quality over quantity in the selection of panelists
- The anonymous argumentation needs to be based on facts
- Phrasing of the questions
- A structured dialogue with continuous and systematic evaluation of produced arguments and claims from multiple views such as importance, desirability, probability and hindrances and perquisites their realization
- Availability, usability and impressiveness of the arguments
- Relevance of the produced material regarding strategic decision making

The anonymity of participants is a very important characteristic of Delphi as the aim of Delphi is to produce a group forecast while keeping the group dynamics at a minimum. The requirement for anonymity is however a demand only for the argumentation phases of Delphi. It is most likely a source of motivation to the participants to know whom they are discussing with. Allowing the participants to take credit for their good ideas and arguments can also be rewarding. (Kuusi 2002, Rotondi & Gustafson 1996)

A critical part of a successful Delphi study is the selection of the panelists for the expert panel. An expert is defined as someone with the knowledge and experience necessary in the subject of the Delphi study. (Clayton 1997) Expertise is a however multidimensional concept. The panelists can not be arranged in a sequence on the grounds of their expertise since the expertise can be focused on different sets of systems and subsystems and the depth and breadth of expertise varies. (Kuusi 2002) The selection of panelists should also give a good representation of the subject under research with bringing out different types of views. The decision-makers whom will utilize the results of the Delphi should be actively involved in the Delphi-process. Using them as panelists is a viable option for this purpose. (Clayton 1997)

One of the most important criteria for selection of the panelists is their motivation to partake in the process. A Delphi study can be very extensive and time-consuming process which should be made clear to panelists when asking for their commitment to the study. (Clayton 1997)

The estimation for appropriate amount of panelists differs between researchers. For example Clayton (1997) suggests a rule-of-thumb of 15-30 people for a homogenous group of experts and 5-10 people for a more heterogeneous population. Kuusi (2002) views an appropriate amount ranging between 15-50 panelists.

Much research has been conducted on the composition of panelists regarding the expertise and reaction to feedback. Rowe & Wright (1999) report in a meta-analysis that the results are mostly inconclusive. The expertise of panelists does however seem to have a positive effect on the results of Delphi especially with the iterative rounds. Regarding the feedback, the most conclusive result was that the opinions of panelists tend to converge towards the group average which is also supported by social sciences research on general human behavior.

3.1.4 Limitations of and critique towards Delphi

In the early days of utilization of Delphi methods, Delphi was mostly utilized as a conventional Delphi. The results of early day utilization of Delphi led to the famous critique of Harold Sackman in his book Delphi Critique: Expert Opinion, Forecasting and Group Process (1975) covering an evaluation of some 150 Delphi researches. In his analysis, Sackman concluded Delphi to be an unreliable and unscientific technique in principle and probably in practice. (Kuusi 1999)

Many authors such as Goldshmidt (1975), Linstone (1975), Ziglio (1996) and Kuusi (1999) have since analyzed and responded to Sackmans critique and deemed it mostly unfair. Goldschmidt agrees that the critique of Sackman was however at least somewhat correct since many of the assessed Delphis were conducted poorly with characteristics such as badly structured questionnaires, no pre-testing or include ambiguous questions. Goldschmidt points out that Sackman is however fundamentally mistaken in his evaluation equating a technique and applications of a technique.

Linstone (1975) argues that Sackmans critique is neither of constructive purpose or even of literary talent. Sackmans claims are based on an assumption that science is “objective” with limited amount of inquiring systems being scientifically legitimate. According to Linstone Sackman applies irrelevant standards to evaluating Delphi, disregards significant supportive research, takes quotations out of context and highlights the poorly conducted Delphis.

Kuusi (1999) analyzes Sackmans critique by categorizing it under 5 themes and 13 specific critiques. Kuusi then proceeds to analyze the critiques by category. Kuusi highlights that Sackmans comparison of Delphi and opinion polls is a bad premise as opinion polls are meant to find out the opinions or behavioral dispositions of persons studied whereas the aim of Delphi is to find relevant arguments regarding future developments. Kuusi underlines that the previous point regarding Delphi is especially relevant in Policy Delphi and its variants such as Argument Delphi developed by Kuusi. Kuusi also points out some relevant arguments made by Sackman that concern content validity and the expertise and representativeness of panelists. The content validity concerns the ability of Delphi research to validate the claims and arguments made by the panel of experts. Validity of arguments regarding the future is difficult to determine. This has led to many models of epistemic utility of futures research, one of which is also proposed by Kuusi. The expertise and representativeness of panelists regards the selection and reporting of panelists which are also relevant points of critique for many Delphi researches. However, once again the Policy Delphi and its variants are not the main target of the critique as the reporting of panelists is usually more open and selection of panelists aims for a more heterogeneous group.

As all methods, Delphi does have its limitations and challenges. Linstone (1975) lists eight possible pitfalls of Delphi:

1. **Discounting the future**: people tend to intuitively apply a discount rate to predicting the future. Vast majority of people have very short planning horizons and short memories. As one moves further away from the present state, uncertainty increases which feels uncomfortable. The discounting pitfall may be avoided by either a) bringing a future event well within panelists current field of observation or planning horizon or b) extending the panelists field of perception or planning horizon.
2. **The prediction urge**: Most people are strongly fond of certainty and dislike uncertainty. This often gives researchers using Delphi an urge to make accurate predictions of what kind of events will unfold and the timeline of when it will happen. Converging results are often accepted as a probable future and wide differentiations are usually considered unusable.
3. **The simplification urge**: People also tend to reduce the complexity of social systems while being convinced that it does not sacrifice realism; simplicity is preferred over complexity. As everything has a dynamic effect on everything most of us do not have the tools or the mental capacity to process with such a multitude of interactions. Forecasting is typically done in the basis of one or several variables and fitting them in a familiar structure consisting of past and present structures. There are also other psychological difficulties such as simplistic misjudgments and biases when dealing with probabilities. Oversimplification can also manifest in the form of communication or language difficulties.
4. **Illusory expertise**: Expertise is challenging to ensure in a Delphi panel. An expert might be too focused on a subsystem of his expertise to take relevant dynamic variables and a holistic view into account. Also, a panel of experts of different aspects of a complex system do not guarantee expertise on the total system.
5. **Sloppy execution**: Sloppy execution may result from a variety of reasons such as poor selection of panelists, poor interaction between researcher and panelist or poor formulation of Delphi statements. The most common form of execution sloppiness is superficial analysis of responses.
6. **Optimism – Pessimism bias**: A common human trait is a bias toward overpessimism is long-range predictions and overoptimism in short range predictions. The overpessimism is also related to the pitfall number 3. The overoptimism of near-future predictions is especially highlighted in technology forecasts as a new technology may already be at hand and the pace of market penetration is overestimated.
7. **Overselling**: Overuse of Delphi method may be harmful to the research. Delphi is not the optimal solution for all needs of knowledge.
8. **Deception**: A Delphi can also be used for deceptive, manipulative purposes especially by means of anonymity that Delphi provides.

According to Green (2014) pitfalls number 3-5, 7 and 8 are notably relevant in educational research. As encouraged by Linstone (1975), the research attempted to counter these pitfalls on behalf of the panelists by providing some preparatory material for panelists for orienting them to futures research regarding pitfalls 1 and 6, and attempting to illustrate the complexity of future events in the interviews regarding pitfall 3 (Appendix 1). The rest of the pitfalls are more of a concern to the researchers and the pitfalls were recognized and beard in mind to avoid them.

As discussed, anonymity of panelists is a central characteristic of a Delphi bringing various advantages. Some aspects regarding the anonymity can however also have negative effects on the overall process as listed by Kuusi (2002):

- Panelists and researchers do not know the representatives of the views presented. Panelists can express conflicting information or views that are inconsistent with their public views without fear of getting caught.
- Purposely spreading misinformation is also possible without fear of getting caught.
- Suspicions of "wrong" opinions can personify to the wrong panelist.
- Exposing confidential information will go unpunished.

The first possible negative effect listed above can also be seen as a positive effect. The anonymity allows for panelists to speak freely independent of their employer or other factors that possibly hinder the panelist from expressing their view based on all the information they possess. The biggest threat in the scope of this thesis would be the second negative effect of the list since the researcher or other panelists might not possess enough information to debunk the misinformation.

3.1.5 Implementation of Policy Delphi in the research

The Policy Delphi started with selection of panelists described in the next paragraph. After the selecting and contacting the panelists an interview framework was produced on the basis of the theoretical framework discussed in the previous chapter. All panelists were interviewed based on the interview framework (Appendix 2) either face-to-face or over the phone. The interviews were semi-structured with the framework having at most minor alterations between interviews and the actual pace and structure of conversation developing towards the end of the interview round.

After the interview round the material from interviews was thematically analyzed and utilized in forming the Delphi round 2 questionnaire. After the second round, answers were once again analyzed and utilized to alter the questionnaire for round 3 with providing all panelists with the content produced in the second including arguments regarding the claims, average votes on desirability and probability, and new claims suggested by panelists.

3.1.6 Selection of panelists

The selection of panelists was done in a large stakeholder cooperation process. Besides utilizing the networks of the researcher, the networks of a major professional and trade union Academic Architects and Engineers in Finland - TEK employees, networks of the supervisors and networks of the employer were utilized to attain a panel of experts. A list of possible candidates to act as panelists was comprised and a total of 32 persons was contacted with a target of 20 panelists. A total of 21 panelists agreed to commit but the last one to enroll made contact too late and could not be fitted to schedule resulting to a total of 20 panelists.

As discussed in the previous chapter, the higher education institution community is a central part of Finnish HE system with all member groups of the community being equally represented. Therefore the aim was to attain equal representation of all the merging institutions and of all the relevant HEI groups. This includes one panelist from all Tampere3 institutions from the following groups: students; professors; other teaching and research staff; and other staff. All other groups had a total of 3 representatives except for students whom had 4 panelists with a last minute addition after a cancellation of another panelist in order to include a non-Finnish panelist.

In addition to panelists from Tampere3 HEIs panelists were selected from stakeholders of HEIs and benchmarking HEIs. The stakeholder panelists represented the company that owns most of university properties in Finland, a company working in close cooperation with Aalto University and the Ministry of Education and Culture which governs all formal Finnish HEIs. The benchmarking HEIs included University of Helsinki and Laurea University of Applied Sciences from Helsinki. University of Helsinki was selected due to its good comparability of fragmented campuses located in different parts of the same city and Laurea due to some interesting pilots in digitalization of HE.

Some recognized limitations regarding the selection of panelists are the balance in gender and nationality. Only 25 % of the panelists were female and only 5 % of the panelists were non-Finnish. In 2015 the combined amount of international degree students in Tampere3 HEIs was 1941 persons and respective the amount of international staff was 607 persons. The total amount of degree students in Tampere3 HEIs was 32665 in 2015 with 16429 men (50,3 %) and 16236 women (49,7 %). The amount of staff in Tampere3 HEIs in 2015 was 4329,5 person-years of which 2249,3 (48 %) were male and 2080,1 (52 %) female. (Vipunen 2015) The relative amount of international degree students from all the students was 5,9 % and amount of international staff members from all the staff was 14 % assuming they work full-time. Therefore a 50 % share of female panelists and 10-15 % of international panelists would have provided a more equal representation of the HEIs.

The panelists of the study are:

- Students:
  - TUT: Student **Mikko Sulonen**
  - TUT: Postgraduate Student **Ugur Kart**
  - UTA: Student **Iiris Suomela**
  - TAMK: Student **Heikki Alho**
- Other staff:
  - TUT: CIO **Jussi-Pekka Pispa**
  - UTA: Educational Technology Manager **Pasi Kytöharju**
  - TAMK: Senior Officer for Development **Ilkka Haukijärvi**
- Teaching and research staff:
  - TUT: Dean **Heli Harrikari**
  - UTA: Lecturer **Jussi Kivistö**
  - TAMK: Lecturer **Timo Nevalainen**
- Professors:
  - TUT: Professor **Hannu-Matti Järvinen**
  - UTA: Professor **Markku Turunen**
  - TAMK: Professor **Päivi Karttunen**
- Stakeholders:
  - University Properties of Finland Ltd: Docent **Olli Niemi**
  - Urban Mill: Urban Miller **Kari Mikkelä**
  - Ministry of Education and Culture: Senior Advisor **Ilmari Hyvönen**
- Other higher education institutions:
  - Laurea University of Applied Sciences: Principal Lecturer **Ville Saarikoski**
  - University of Helsinki: Professor **Hannele Niemi**
  - University of Helsinki: IT Manager **Minna Harjuniemi**
  - University of Helsinki: Open University Director **Jaakko Kurhila**

3.2 Workshop on digitalization of education

A workshop regarding the digitalization of HE in Tampere3 was organized in TUT at 2016-05-30. The theme of the workshop was “Digitalization, utilization of technology in teaching and flexible studies”. The workshop produced qualitative data and was analyzed accordingly.

3.2.1 Analysis of the results

The workshop results were analyzed with qualitative research methods based on the works of Tuomi & Sarajärvi (2002) on content analysis and Braun & Clarke (2006) on thematic analysis. The results of Delphi round 1 was also analyzed with the same qualitative methods. The methods are described in more detail below.

Tuomi & Sarajärvi (2002) describe the process of a data-based content analysis to roughly form of three phases: 1) reducing the content, 2) grouping the content and 3) abstraction

of content. In a mode detailed description the process of interview data –based content analysis would consist of the following phases:

1. Listening to and transcription of the interviews
2. Reading familiarizing with the transcribed content
3. Exploring the content for simplified expressions
4. Listing the simplified expressions
5. Comparing the simplified expressions for similarities and differences
6. Combining the simplified expressions and forming subclasses
7. Combining the subclasses to form classes
8. Combining the classes to form an umbrella concept

On a more general level content analysis is described as a method of systematic and objective analysis of data. A common flaw in content analysis is to treat the results of a content analysis as conclusions by itself, when content analysis only provides the data necessary for making the actual conclusions. The research data represents the subject under research and the purpose of content analysis is to create a clear description of the subject. Content analysis aims to organize the data to a compact and explicit format without losing information. The purpose of content analysis can actually be described as increasing the amount of information that can be derived from the data. (Tuomi & Sarajärvi 2002)

Content analysis gives the researcher quite a lot of freedom in how to proceed with the research but does come with some limitations. One central aspect of freedom is that the concept of content analysis covers both content analysis and content specification, i.e. the results of analysis can be used to produce either verbal or numerical results. Second, the analysis of qualitative data can be either inductive or deductive. A notable limitation in content analysis is that the methodology of research is of great significance as a criterion of reliability.

On a similar note as the eight phases of content analysis, Braun & Clarke (2006) have formed a six-step process to guideline a thematic analysis:

1. Familiarizing yourself with the data
2. Generating initial goals
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

More generally thematic analysis is described as a method of identifying, analyzing and reporting themes within data by minimally organizing and describing data in detail. Thematic analysis is very widely utilized but rarely noted as ‘thematic analysis’ but is often claimed as something else such as discourse analysis or content analysis or not identified

as a specific method at all. Thematic analysis does not require as detailed theoretical or technological knowledge as many other similar methods of analyzing themes across a data set such as grounded theory. Thematic analysis can be conducted within realist/essentialist and constructionist paradigms. (Braun & Clarke 2006)

The technique used in the thesis can be described as a combination of the methods described above. Due to the data size of workshop being very small, the extensive nature of content analysis was not deemed necessary. The approach of Braun & Clarke however is seen to be oversimplified for a purpose of a thematic analysis. The qualitative data analysis of this thesis follows the first seven steps of content analysis and all six steps of thematic analysis as described above with an essentialist/realist and inductive approach. (Tuomi & Sarajärvi 2002, Braun & Clarke 2006)

4. RESULTS

This chapter presents the results of the workshop and Policy Delphi. The Delphi results are presented in two phases, first covering the interviews which comprise the first round of Delphi and second covering the rounds 2 and 3 of Delphi consisting of questionnaire results.

4.1 Workshop on digitalization of Tampere3

A workshop regarding the digitalization of education in Tampere3 was organized in TUT at 2016-05-30. The theme of the workshop was "Digitalization, utilization of technology in teaching and flexible studies". The workshop was scheduled to last for three hours and consisted of an introductory part, working in small groups and a summary. The workshop was an open event for all students and staff of the Tampere3 HEIs. The participants were asked to sign up beforehand which yielded a total of 67 registrations. The amount of participants was not counted in the workshop making the number of participants only an estimate. Most of the participants were teaching and research staff or service staff but there was also a representation of the students. The participants that provided their background organization when signing up produced a distribution as follows: 26 participants from TAMK, 18 participants from TUT and 12 participants from UTA. 43 participants listed themselves in a department of teaching and research, seven in a department of support services and 18 provided no information of their department. The results of the workshop are presented in the following sections.

Positive aspects in the current level of digitalization regarding teaching

Tables 1-4 cover the current aspects of digitalization of teaching that already work well. Table 1 covers all the responses combined, table 2 covers only the responses of TAMK representatives and tables 2 and 3 cover responses of UTA and TUT representatives respectively. It is important to note that some responses were 'general' responses, i.e. not focused on any specific institution resulting that the total amount of responses differs from the combined amount of institutional responses.

Table 1. *What currently works well regarding digitalization of teaching (all 130 responses)*

TIMES MENTIONED	THEME
42	digital tools and infrastructure are adequate for current needs
16	adequate support for utilization of technology
15	digitized processes
14	learning management system in use (moodle)
13	flexibility of studies
6	motivation of teachers and/or students
4	physical learning environments
4	availability of peer support for teachers
3	quality of teaching
3	network connections on campus
2	availability of scientific material
2	communications
1	assesment of students
1	marketing of studies
1	competences of teaching personnel
1	possibilities for virtual international collaboration

Table 2. *What currently works well regarding digitalization of teaching, TAMK (44 responses)*

TIMES MENTIONED	THEME
11	digital tools and infrastructure are adequate for current needs
9	digitized processes
7	adequate support for utilization of technology
5	learning management system in use (moodle)
5	flexibility of studies
2	network connections on campus
2	availability of peer support for teachers
1	communications
1	marketing of studies
1	possibilities for virtual international collaboration

Table 3. *What currently works well regarding digitalization of teaching, UTA (11 responses)*

TIMES MENTIONED	THEME
4	digital tools and infrastructure are adequate for current needs
3	adequate support for utilization of technology
2	flexibility of studies
2	learning management system in use (moodle)

Table 4. *What currently works well regarding digitalization of teaching, TUT (26 responses)*

TIMES MENTIONED	THEME
11	digital tools and infrastructure are adequate for current needs
3	physical learning environments
3	adequate support for utilization of technology
3	learning management system in use (moodle)
2	flexibility of studies
2	digitized processes
1	availability of scientific material
1	quality of teaching

The digital tools available regarding current needs of HEIs clearly stands out as the most valued aspect of current digitalized solutions both in a general and in an institutional level. Adequate support for use of digital solutions comes in second in the cumulative responses and responses of UTA and TUT with coming in third for the responses of TAMK. Digitized processes was the third most often mentioned theme in cumulative results and results of TAMK and in fifth place for TUT. Other mentionable themes were flexibility of studies that was in the top 5 of all categorizations and digitized processes that were in the top 5 for all categorizations except for UTA.

So what can actually be concluded from the results? As a general notion, digitalization of teaching covers a very broad spectrum of operations. This can be interpreted as a positive result as digitalization is often only understood as a set of digital tools when it should be perceived as a phenomenon.

The respondents seem to be very content with the current digital infrastructure for teaching purposes such as video lecture infrastructure and electrical exams. The Learning Management System (LMS) used by the institutions was highlighted in so many responses that it is highlighted as a theme of its own even though it is also part of the digital toolset

for teaching. The good availability of support including educating teaching personnel and peer support is an important aspect in harnessing digitalization.

The respondents seem to also be quite satisfied with the digitized processes. Digitalization has quite well penetrated the administrative tasks to streamline the processes such as selection of students to HEI, credit transfer and student register.

The current level on flexibility of studies was also valued among the participants. The examples provided by the participants included digitalized solutions such as video lectures, sharing study material and possibility for the teachers to select digital platforms best suited for their purposes.

A positive mindset towards digitalization is important for any change to take place. The motivation of teachers and/or students in harnessing digitalization was stressed by several respondents.

The physical infrastructure was also highlighted as an important aspect of digitalization of teaching and an aspect that was especially underlined in TUT. Even with extensive digital infrastructure, teaching and learning can still be expected to be most motivating and therefore effective in face-to-face interaction in which physical infrastructure supporting digitalization is important.

Aspects of digitalization of teaching that need to be developed

Table 5 covers the responses in what aspects of digitalization of teaching require further development. The answers were not institutionally specified.

Table 5. *What needs to be especially improved regarding digitalization of teaching, all respondents*

TIMES MENTIONED	THEME
9	flexibility of studies and use of digital systems
9	fluency of processes
8	chances for teachers to participate in pedagogical/technological training
6	pedagogical support in use of technology in teaching
6	utilization of technology to enhance teaching, not just for the sake of technology
6	digital tools and infrastructure
6	digital tools should be integrated to teaching
6	too many digital systems
5	compatibility of digital systems
5	competence level of teachers in utilization of technology
3	acknowledging informally gained competences or competencies gained in previous degree
3	utilization of students' mobile equipment in teaching
2	internal communications
2	motivation to utilize digital teaching solutions
2	resources to digitize teaching contents
2	digital leap demands a change of mindset from both students and teachers
2	scheduling of courses
2	programs and systems are unfinished when implemented to use
2	programs and systems are not user-friendly
2	electrical exam still has challenges with subjects such as mathematics
2	lack of peer support for teachers
1	moodle does not meet the needs of teachers
1	lack of technical support
1	availability of scientific material
1	lack of tools to promote openness of teaching
1	physical learning environments
1	parking spots in Tampere3 HEIs
1	network connections are not adequate everywhere in campus
1	applying to higher education
1	entrance exam
1	tailor-made support for different fields of science
1	competence level of students in utilization of technology
1	strategic management regarding digitalization of teaching

The aspects in digitalization of teaching that need further development resulted a more compact list of items. Even though flexibility of studies and availability of digital tools and infrastructure were mostly highlighted as aspects that are already on a good level, some participants felt that the utilization rate of technology in teaching is still too low. The integration of digital tools to teaching was especially highlighted. The same goes for

fluency of processes: even though they were mostly recognized as a strength, the potential has not nearly been achieved.

Many responses underlined the poor chances for teachers to further educate themselves in pedagogical or technological training and many responses highlighted that teachers are not competent in use of digital solutions. A lot of responses also emphasized the need for pedagogical support in use of technology as use of technology is not a value in itself.

Some responses underlined problems with digital tools and infrastructure. Some respondents felt that there are too many systems available which is confusing while some respondents felt the supply is inadequate. The compatibility of different systems was also highlighted as an issue.

4.1.1 Delphi interviews

The Delphi-interviews were conducted between 2016-4-28 – 2016-5-30. The average length of an interview recording was 1 h 29 min with the longest one being 2 h 20 min long and shortest one being 52 min long. All interviews were conducted face-to-face except for one which was conducted over the phone due to the physical distance between two consecutive interviews.

The interview framework was sent to the panelists before the interview in all cases except one. The panelists also had a chance to comment on digitalization of higher education outside of the interview framework. The interviews were transcribed according to the recordings and sent to the interviewees for comments before advancing to the following Delphi rounds. The panelists also had a chance to add contents to the transcription if necessary.

Besides the interview framework, a cover letter was sent to the panelists providing further information on the research subject. The cover letter included material for preparing the mindset of the panelists to a futures research interview, such as informing the panelists of humane limitations in predicting the future and some scenarios of HE futures conducted by EU commission and OECD. The interview framework and cover letter are attached to this research as appendix 1 and 2.

The contents of the interviews are described in more detail in the next sections. The first section covers the current state of digitalization in Finnish HE. For this section, the subjects that panelists highlighted differed by a large margin as digitalization was interpreted in multiple ways depending on the background of the panelist. The following sections before the last section were questions of a more structured nature. These sections are transcribed by thematic analysis of the contents of the interviews. The last section is again a question of a more open nature. The last section was however also analyzed thematically

as the interview framework led to relatively small dispersion in the contents of answers. The total amount of panelists was 20 persons.

General views on digitalization of higher education and the present state of digitalization in background higher education institution and/or in a national scale

The panelists were mostly quite satisfied with the current degree of possibilities for utilizing digitalized solutions in Finnish higher education. However, even though the panelists recognized a lot of potential in utilizing digitalization, they mostly felt that very little of the potential has been capitalized to date. Some panelists expressed their concern on the rate of digitalization of Finnish HEIs compared to international institutions.

In teaching and learning, digitalization has so far mostly advanced in flexibility of studies with solutions such as electronic exams or providing the course material in a digital form. The utilization of students' mobile devices was seen as lacking as almost all students carry a mobile device with them today. An extensive amount of pilots has been conducted in utilizing new kinds of digital learning environments or utilizing the existing technologies in a new way, but the pilots have mostly not spread to everyday teaching. Overall teaching was seen to have changed very little with development of technology.

The digitalization of research has already penetrated Finnish HEIs quite well. The accessibility of information, ease of international collaboration and computer-based research operations were described as technologies that have revolutionized the way of doing research. The higher penetration rate of digitalization in research compared to teaching was seen to especially result from two reasons: the competition in research has globalized much earlier than in education and the benefits are more concrete and realize faster.

The incompatibility of digital systems was seen as a problem in collaboration between higher education institutions in both national and regional level. In an institutional level, the digital systems were seen as fragmented and not supportive of one another.

The interviewees stressed the need for user-centered design in development of digital infrastructure. The user-centered approach should account for both the academic community and external stakeholders such as companies located in the campus area.

According to the views of the panelists societal impact has not seen much development with development of technology. Higher education institutions have adapted to using social media in communications and marketing but for example accessibility to and communications of information produced by the institutions were seen as aspects that have not developed with digitalization.

The current IT services were seen as too controlling. Strict control on what digital systems can be installed on the staff computers was seen as problematic as the amount of possible

digital tools has ballooned. Some staff members have independently transferred to a practice of Bring Your Own Device (BYOD) to evade the problems caused by control-focused IT services.

Registration to courses, whether as an open university student, continuing education student or degree student was seen as too complicated and forbidding compared to global higher education service providers with products such as MOOCs. The Finnish higher education institutions were seen to aim to competing on the national rather than the international market which was seen as a problem especially considering the excellent international reputation of Finnish education.

The funding of higher education in Finland by 2030

14 of 20 panelists predicted that the amount of public funding of higher education is going to either decrease or remain in the current level by 2030. The rest of the panelists were undecided or did not feel comfortable on taking a stand on the subject. The public funding was predicted to decrease in both public basic funding of HEIs and public research funding channeled by organizations such as Academy of Finland and Tekes (Finnish Funding Agency for Innovation).

Funding of HEIs from private sources, i.e. funding from private sector or non-governmental organizations, was seen to increase by 2030 as higher education institutions pursue more and more collaboration with external stakeholders. The increasing importance of private funding was highlighted by seven panelists. International benchmarking however indicates that private funding is unlikely to match the budget cuts of the public sector.

Donations to the foundation-form Tampere3 university and funding operations with income from interest of foundation capital was not viewed as a viable solution to ease coping with decreasing public funding. Three panelists did however predict that the private sectors interest towards donations for HEIs will increase.

Digitalization as a possibility to cut costs in higher education also divided the opinions of panelists with seven panelists predicting digitalization to cut costs and five panelists predicting that it won't. Four panelists highlighted that even if savings were achievable through digitalization, it should not be the mindset in digitalization but instead it should be strictly quality of education and research. Administrative processes and the amount of physical space needed were seen as the only viable options on where digitalization will provide *definite* savings by automating of processes and with decreasing need for physical space. In teaching and learning the necessity of at least the current amount of teachers was mostly seen as absolute. Three panelists did however see a possibility that some costs could be cut by utilizing collaborative teaching between HEIs. Two panelists highlighted that the initial investment costs and constant updating required for digitalization of teaching and learning were seen to be at least as expensive as current education.

Three panelists emphasized their frustration to the burden of what applying for research funding causes to research staff. Applying for funding is a very resource-demanding process and the resources could be reallocated to research and teaching if the applying process could be streamlined.

The views on the effect of tuition fees for students coming from outside of EU/ETA area were controversial, as were the possible tuition fees for all higher education students in Finland. Two respondents predicted that the tuition fees, either only for outside EU/ETA or for all students, would bring some relief to higher education institutions in times of strict public funding whereas two respondents stressed that international benchmarking has strong evidence on public funding decreasing at the same rate as tuition fees provide new resources.

Autonomy of higher education institutions and political governance

The autonomy of higher education institutions was very highly valued among panelists with half of the panelists explicitly stressing the importance of autonomy. Eight of the panelists emphasized the need for new channels of funding to decrease the governance of main funders such as the Ministry of Education and Culture. Financial autonomy was regarded as a prerequisite of functional autonomy. Four interviewees emphasized that it is only natural for the ones that finance higher education institutions to expect governance over the institutions.

Four panelists viewed regional politics as a hindering factor in developing HEIs and especially universities of applied sciences. The national level governance of HEIs was seen as contradictory regarding the regional politics. Four panelists claimed that HEIs in Finland have not yet learned to operate in the full extent of their autonomy as it has increased relatively recently in both higher education sectors. Two interviewees stressed that it stands to reason to have political governance over higher education institutions as they have great societal impact and are heavily publicly funded.

Notable themes highlighted by only a single panelist were:

- Political governance is shortsighted and research should therefore not be governed politically as the benefits of research mostly materialize only in long-term.
- Politicians are currently especially interested in enhancing the employment rate and harnessing HEIs to serve economical goals. Research and science are under threat to take a back seat in HE policy.
- The geographical fragmentariness of HEIs and budget cuts from HE funding decrease the level of autonomy of HEIs.

Level of education in Finland and value of formal higher education degrees by 2030

The panelists had some differing in opinions on how the level of education should develop in Finland. Seven of the respondents viewed that the level of education in Finland will or should decrease by 2030 and seven viewed the level of education staying in the same level or increasing. Six panelists did not take a stand on the level of education per se, but stressed the increasing need for continuing education and emphasized appreciation of competences over formal degrees in the future.

Three of the interviewees stressed that the need for vocational higher education will increase with the expense of academic higher education as the demand of general working life skills increase. Two panelists expressed their views as an optimizing problem; the level of education should be optimized by productivity in short and long term. Two respondents emphasized the necessity of focusing study places on fields of education with high employability.

Two panelists pointed out that there should be more focus on the education process as a whole. The competence profiles of students entering higher education are very diverse depending on a students' secondary education and preliminary and elementary schooling. Information regarding the competence profiles of students entering higher education would help in planning the curriculums and personalization of studies.

Eight of the panelists expected that the requirements of formal higher education degrees in employment was going to more or less decrease. In the private sector this trend can already be observed in some trades such as ICT. The public sector was expected to lower their standards in requiring higher education degrees by two respondents and three respondents expected the requirements to stay in the current level. The value of formal higher education degrees was especially seen in comprehensiveness of the degrees.

Continuing higher education

The panelists were very unanimous on the demand of continuing education increasing towards the future. Twelve of the panelists explicitly mentioned that the demand will increase and no one claimed that it would decrease or remain in the current level. Some panelists emphasized that the increase in demand is going to happen in a global level which should be kept in mind when developing the offerings of continuing education.

The interviewees also identified many other aspects that are important to note in development of continuing education. Five panelists emphasized the need for smaller packages of continuing education than traditional university courses. The demand seems to evolve to emphasize skills, competences and knowledge on a micro-level. The higher education institutions should be able to provide continuing education modular enough to also satisfy these micro-level needs where digital solutions such as modular MOOCs could be a viable option. Two panelists stressed the importance of flexibility, i.e. independent on time and place, in providing continuing higher education which also promotes harnessing dig-

italization. Two panelists stressed that in developing the offerings in continuous education, more attention should be paid to the needs of society and enterprises regarding the contents of studies.

Three respondents suggested that continuing education should be viewed as a means of committing graduates to the higher education institution. This could be achieved for example by providing a lifetime access to information produced by the institution or by providing free continuing education until a graduate is employed.

Two respondents suggested that continuing education should be integrated as a natural part of degree studies to mix degree students and continuing education students. This would bring valuable information to the courses from graduates that have gained work experience in the field.

Internationalization of higher education

Fourteen panelists explicitly predicted the internationalization of higher education institutions to continue to increase towards 2030 and none of the panelists predicted for the level internationalization to decrease. There were however some differences in the panelists' views on the speed of change.

The panelists expected the level of internationalization to increase especially by different forms of collaboration with international higher education institutions. Three panelists emphasized the need for incentives to clarify the goals of internationalization as the governance of higher education institutions rewards only for a few spesific components of internationalization. International collaboration on course offerings and joint degrees, whether digital or not, are examples of trends that are currently missing incentives. Platforms for collaboration already exist. Two panelists stressed that the current internationalization is quite superficial on some aspects with the only incentive being on rewards in public funding which results to quantity over quality. Two panelists suggested that newly industrialized countries and developing economies will soon mature into new interesting collaboration partners as their HEIs develop.

Two respondents connected the level of internationalization with education exporting which according to the panelists has not produced much results yet. A major challenge in education export is attaching the students to the academic community if the education is provided through a branch office of a HEI.

All panelists that took a stand on the global language of higher education and research predicted that English will maintain its position as the *lingua franca* of HE. Some panelists predicted major competition from languages of countries with extensive amount of higher education graduates such as China.

Other topics mentioned by the panelists included:

- The Finnish HEIs need to position themselves in a global context instead of a national context, but the large regional impact should also be valued.
- Tuition fees to students outside of EU/ETA will decrease the amount of international students in Finland especially in short term.
- Online course offerings should be a means of attracting foreign students to study a degree in Finland.
- Migration of peoples will also internationalize Finland. The biggest threat to this trend is racism.
- Internationalization of higher education has resulted to the brand of a HEI weight over the country where it is located. The pace of this trend will accelerate towards the future.
- Hiring international professors to Finnish HEIs brings some new challenges as foreign professors lack networks with industry compared to Finnish academics.
- International mobility of Finnish secondary education graduates has increased which puts more pressure on attracting international students to ensure sufficient amount of competent workforce.
- Course offerings from global education market should be utilized more in Finnish HE.
- Internationalization is overvalued in some cases resulting to discrimination of Finnish applicants in academic positions.

Skills, competences and knowledge provided by higher education

The panelists reverenced the skills, competences and knowledge produced by the present day Finnish HE. These include for example information retrieval skills, problem solving skills, analytical thinking skills, written communication skills and knowledge about the substance of field of study.

Seven panelists stressed the importance of lifelong learning skills including both learning to learn and the attitude to develop oneself throughout life. Strongly linked to this theme, two panelists highlighted the need for graduates to better recognize their own set of skills, competences and knowledge. The ability to adapt to new situations was stressed as important by a total of four panelists.

Five panelists underlined the need to enhance the graduates' skills in social interaction, three of which underlined especially social interaction skills in a *virtual* environment. Three panelists predicted the need for language skills to increase and three panelists predicted the need for skills in working in inter-/multicultural teams to increase.

Curriculums providing a broader range of competences and with cross-disciplinary contents were underlined by four panelists. Three interviewees emphasized the need for enhancing information retrieval and processing skills of graduates.

Other skills, competences and knowledge necessary for future graduates mentioned by the panelists included:

- General working life skills
- Metaskills achieved through utilization of advanced pedagogy
- Self-confidence
- Networking skills
- Philosophy of science
- Soft sciences to all students studying in STEM (Science, technology, engineering and mathematics) fields
- Business skills
- Marketing as a special focus in entrepreneurship
- Freelancing as a special focus in entrepreneurship
- A broad understanding of society
- Utilization of digital tools
- Holistic systems analysis
- Network way of working
- Understanding the changes in the labor market

Other topics mentioned by the panelists included:

- A megatrend that might affect the future required competences is localness such as local food, local democracy etc.
- A portfolio of the skills, competences and knowledge that students attain throughout their education should be provided to students
- With continuing education becoming more and more common, not all skills, competences and knowledge need to be attained in the (first) formal higher education degree. The gaps in skills can be filled out later as need arises.
- The skills, competences and knowledge attained with work experience should be better recognized and harnessed in formal degrees.
- The curriculum should be planned as a whole regarding the skills, competences and knowledge the degree should provide in different stages of higher education.
- Finding the right balance between breadth and depth of studies is difficult.
- Educating the graduates to be self-dependent is important.
- Learning by doing is essential.
- Giving all students just the right amount of challenge is important in which learning analytics solutions could prove of value.
- Industry and commerce should be involved in planning the curriculum but not dictate the contents.

Service experience and operating in the global market in higher education

The theme of service experience and operating in the global market in higher education produced a high variation in responses. Most of the panelists recognized the need for enhancing the service experience of higher education institutions in order to maintain the interest of students and stakeholders. Digitalization of operations was seen as a necessity for enhancing service experience with scarce resources. The panelists stressed that accounting for service experience requires most of all a change in the mindset of the staff of HEIs.

Three panelists underlined the importance of participating in the global online education market. As good quality online education is very resource-intensive, national or international collaboration should be promoted to share resources. Two respondents highlighted the need for producing education as an export in a national collaboration since Finland has a very good reputation as an education provider. Finland has several consortiums producing education as an export and as a result they outbid each other to the lowest price possible. The context of culture is important to acknowledge as no education can be exported as such but needs to be fitted in the context of culture.

Two panelists stressed the importance of involving students more in the development of HEIs and especially development of education with co-creation methods. The service experience of students will highlight already in near future due to tuition fees and increase in global HE offerings. Students will start demanding more from their education as they have to pay for it and as global offerings keep getting better and broader. The degrees must be more product-oriented and students must be able to complete them in the supposed timeframe. This could result to a narrower amount of choice in degree contents. An important aspect in the service experience of students is a sense of being a part of the university community which demands a lot of both formal and informal interaction with academic staff. In developing the service experience businesses and other stakeholders operating in the campus area should also be involved in the development.

Two panelists suggested that students should be able to build degrees from tiny fragments of online higher education available in the global market. The degree would then be authenticated by the aggregators which in the Finnish context would mean HEIs. Online markets of higher education make the course offerings almost unlimited so Finnish HEIs narrow their course catalogue only after very thorough consideration.

Academic work

The nature of academic work was expected to change a lot by the year 2030 especially in teaching. In research the change was predicted to concern especially the further internationalization of research. The governing of higher education institutions was seen to have transformed to more of a business-type organization (i.e. a New Public Management approach) and the trend was mostly predicted to continue. Not all panelists were however

convinced that HEIs have taken example from the right kind of businesses when transforming their operations.

The role of the teacher was expected to change with harnessing modern pedagogy to higher education. Seven panelists predicted the job of a teacher to transfer more to a facilitator or mentor of learning which emphasizes the interaction skills and pedagogical know-how of teachers. Panelists also suggested that the role of teachers might develop to an administrator of information with the exponential growth of information and that the need for showmanship will increase with globalization of higher education offerings. The learning process needs to be optimized with the combination of technology-enabled self-studying and mentor-like teachers in order to compete in the global market of higher education and for the graduates to compete in the global market of higher education graduates.

The teachers' ability to utilize modern technology was not seen as a major issue in the future as user experience of digital systems keeps improving. Teachers and students should have a freedom in selecting their digital tools best fit for their teaching and learning purposes. The role of IT services should be of supportive nature instead of strictly controlling what digital tools can be used. The role of colleagues and peer support was also seen as important in utilization of technology in teaching. Teachers were predicted to need more continuing education which should be flexibly available.

A total of seven panelists also emphasized the need to value the work of teachers more with incentive schemes and possibilities to progress in career. Seven panelists also predicted the role of professional leadership skills to increase in academic leadership positions. Doctoral degrees and academic merits were considered to maintain as a requirement for academic management positions as higher education institutions need to value their own products when selecting management. Research was seen to dominate in academic merits regarding advancing to management also in the future due to research being more easily measurable. More professional leadership was seen as a possibility to reduce the silo effect in higher education. Another point of view was expressed that hierarchy will greatly decrease in the future as network way of working and amount of information increases over time.

The division of labor among academic staff was seen to polarize with four panelists predicting the practice of everyone teaching and researching to come to an end and one panelist expecting the practice to continue as usual. The panelists emphasized the importance of possibility for staff members to focus on their interest whether it is in teaching, research or both.

Digitalization was seen as an important tool in reducing the administrative tasks of academic staff to allow more focus on teaching and research. Applying for funding was seen to take too much time off of teaching and research and the panelists hoped that it will be

streamlined in the future. The need to alter the study contents to match the societal needs in era of digitalization was also emphasized.

Academic community

A robust academic community was highly valued among panelists. The panelists were unanimous in their views on the necessity and benefits of academic communality. A HEI was seen as an environment where all members of the community can give and receive. The value of interaction was seen to increase with the amount of information available resulting to selection of relevant information becoming more and more crucial.

Academic communality was underlined to increase by means of virtual collaboration by four panelists. This concerns especially the research staff as they tend to primarily find their academic community in their field of science in a global scale and only secondarily in local scale of department or faculty level. Development of digitalization brings new tools to form even larger international academic communities.

On the other hand, the significance of physical campus on development of academic communality was underlined by two panelists. Even with advanced digital solutions, face-to-face interaction still prevails as the best way to teach, learn, innovate, network etc. A good example of this is academic seminars which are sparsely organized as web-based webinars due to the informal, networking part of seminars.

Interaction with the society outside of academic community was emphasized by three panelists. As important as academic community is, it should not lead to a situation where the academic community only interact between each other. Higher education institutions should be more open to local communities both physically and digitally.

Digitalization was considered as a necessary tool for further development of communality. Communality was seen as one of the main goals of Tampere3 and the necessity of providing enough resources for its development in the early phases of merger was underlined by two panelists.

Digitalization was also seen to decrease the amount of communality in some cases. Two panelists highlighted the possibility of some higher education students being left out of the community with the globalization of higher education via online education. The students that have no possibility to access the physical campus would have no means for informal interaction within the university community unless digital tools are harnessed to enable virtual participation. Digital interaction can also lower the threshold of interaction for the less social members of community.

Challenges in advancing communality included too much competition between and silo effect inside fields of science. Competing from the same scarce resources hinders openness which is a core building block of communality. The silo effect inside fields of science

may benefit the academic communality of the field of science, but hampers the communality in an organizational level.

Disruptive technologies regarding higher education

The panelists had overall high expectations on the disruptiveness of new technological solutions regarding HE and research. The concrete technologies mentioned by panelists were mostly related to the examples given in the interview framework which included virtual reality (VR), augmented reality (AR), big data and learning analytics. These examples are also commonly mentioned in the literature regarding digitalization of HE which in itself fuels the disruptiveness of the technologies.

Virtual and augmented reality were expected to advance to educational purposes already quite near in the future with nine panelists emphasizing the disruptiveness of the technologies. The market especially for VR has recently seen many products aimed at the consumers which will most likely speed up the development of pedagogically sound VR solutions also in the field of education. The usefulness of VR was seen to be somewhat related to field of science with for example technology and medicine likely benefitting the most from VR.

Learning analytics, an application of big data, was predicted to provide enormous possibilities to advance learning in HE by seven panelists. However, four panelists were more or less sceptic towards learning analytics emphasizing the need for a giant leap in its development before it could ever prove useful in education. Utilization of learning analytics might be hindered by both students shunning assessment done by a machine and teachers whom are scared of what learning analytics might reveal regarding the quality of teaching.

Big data in itself was highlighted as a disruptive technology in HE by four panelists. Outside of learning analytics, big data could prove very useful for example in designing the physical campus to be as smart as possible. Enthusiasm and interest play a major role in learning which could be better harnessed if big data of social media would be available for HEIs. The big data regarding students should be available for them to help with development of self-awareness.

The need to make changes to curriculum due to disruptive technologies was underlined by two interviewees. Besides the disrupting the way teaching and learning is organized in HE, disruptive technologies will alter most if not all jobs and students need to be prepared to the changing demands of the labor market.

Openness, availability and accessibility of data

Openness, availability and accessibility of data were regarded as highly important trends. Researchers should be able to freely disseminate their own research which is currently

hindered by major science publishers with the most prestigious journals that usually charge extra fees for open access publishing. With the financial standing of HEIs not getting any better, open access publishing needs to increase at the expense of for-profit scientific publishers. Business secrets are a challenge to open access publishing in HEI-business research cooperation but on the other hand provide the most recent research results also from the private sector to HEIs.

Openness of data was explicitly emphasized as a highly necessary trend by fifteen panelists. Even though many challenges need to be resolved before the practice can transit to a new norm, open data was seen as the only possible triumphant strategy. In the future research might as well not exist at all if it can't be found and accessed using search engines. Public funding also puts pressure on open access. Open data will enhance the quality of research and enables reuse of data for different purposes. Transition will require strong leadership and to ease the transition to open data policy more examples of open data benefits should be brought to light. One aspect hindering the advance of openness and availability of data was seen to be the intellectual property law which was seen to be lagging behind of technological development.

Improving the accessibility of data was emphasized as a trend of high relevance by seven panelists. The importance derives especially from the exponential growth in the amount of information. Accessibility was also highlighted as a means for improving the appreciation of scientific data in decision making. One important aspect of accessibility is also the hastiness of scientific publishing which requires some development. Accessibility also sets demands for improving communications, promoting the expertise of scientific staff and finding a balance between popularization of science and scientific impact.

Data protection and privacy

The biggest concern regarding data protection and privacy was how it is regarded as a more serious issue than it really is and how it hinders technological development with eight panelists emphasizing this aspect. Data protection and privacy should be a supporting service instead of being a limiting service. For example students should use which ever applications they see best suited for a given task. Data protection and privacy should be analyzed from a holistic perspective to speed up the rate of change to a more facilitative policy. Data privacy has recently evolved a lot in the private sector for example in user identification with the HEIs lagging behind in development.

Learning analytics and other big data solutions were emphasized as a major challenge in data protection and privacy by five interviewees. The data regarding students' personal data (MyData) should be available for students but needs to be secure from access of others.

Three panelists underlined authoritative obligations and HEI-business cooperation imposing some requirements to data protection and privacy. Contracts made with businesses

are commonly very demanding regarding data protection and privacy. The need for HEIs to have their own student registers set some demands for data protection and privacy regarding authoritative obligations. Ease in these kind of data protection and privacy issues was predicted with the development of blockchain technology.

Digital campus in 2030

Besides the previous sections highlighting the major trends of HE and the requirements it sets for development of HEIs in a digital era, the interviewees had a chance to describe other requirements or underline previous most important characteristics they predicted necessary in development of a future-proof HEI with the focus on Tampere3.

The importance of academic communality was underlined by six interviewees. The panelists also highlighted that in order to succeed in academic communality it needs to be properly resourced and managed and interaction should be supported. Also, the design of physical spaces is important in advancing academic communality. Availability of peer support was emphasized by two panelists. Utilizing digitalization was seen as a viable solution for enhancing peer support.

Five panelists highlighted the importance of user centered or human centered design in planning both the digital and physical campus for optimal service experience. The services should be available in the same location where the users are. The needs of users should be actively accounted for not only by the present day standards but also according to predictions of future needs. Two panelists highlighted the point that a digital campus is never complete but needs constant development as technology advances. Technology should be harnessed to enable HEIs to concentrate on their missions and to be able to do them as effectively as possible.

Change in the paradigm of teaching in the digital era was emphasized by five panelists. The building blocks of courses and degrees need to be updated and teachers are expected to need to adapt to a more facilitative role. Digitalization can ease cross-disciplinary studies and enable diversity in pace of learning and learning methods. Commitment of students can prove to be a challenge especially if digitalization is utilized in a way that promotes studying alone. Digitalization is only a medium as the real target is to motivate students.

The role of physical campus was regarded as a very important aspect of digital campus with five panelists emphasizing the importance. The physical campus should promote modern education such as flipped classroom and blended learning with spaces suitable for both formal and informal interaction.

Openness of data and teaching were highlighted by three panelists. Open science is a very hot topic in an international level at the moment and is expected to advance quickly.

Global outreach and international collaboration was highlighted by three panelists. HEIs should position themselves on a global scale and collaborate with other institutions. International networks are growing in importance for both students and staff.

Three panelists stressed the importance of diversity in digitalization. The needs of the whole academic community and stakeholders are best met with a broad combination of digital and physical environments and modus operandis. A broad selection of programs for studying and research should be available. The digital systems should communicate with each other and should have a common platform to ease navigation. Flexibility and mobile use are central characteristics for digital content.

The need to better involve surrounding society to HE was underlined by three panelists. Being a public service, HEIs should open up to local citizens and businesses to maximize their societal impact. HEIs should be a platform for innovations and societal development.

Two panelists stressed that Tampere3 should aim to be a forerunner in digitalizing HE and start selling it for other HEIs. Finland has a good reputation in both ICT and in education.

Information based management should be a vital part of a digital campus according to two of the panelists. As more and more data is available to be collected at cheaper and cheaper costs, it also needs to be capitalized for it to be of any use.

Other topics mentioned by a single panelist included:

- A good benchmarking target for digital solutions can’t be found among HEIs but from other public institutions or businesses instead.
- The organizational boundaries such as faculties should not be visible to students.
- A pragmatic approach to management of change is required. The strengths and weaknesses of the merger should be clearly communicated. Succeeding in the change demands commitment of all employees.
- Learning environments should be progressive and learning analytics should be utilized in teaching and learning.
- The role of IT services should be one of supporting the staff and students to have the best available tools, not one of controlling nature.
- While the choice in global market is constantly increasing, standing out in the vast array of offerings is important.
- Harnessing the laboratories of HEIs for remote access of international stakeholders would make Tampere3 an attractive partner in cooperation.
- The digital systems should be constantly updated with minor updates to reduce the need to educate staff and students to the updated system.

- The campus infrastructure should be made as smart as possible. The infrastructure should communicate with the people located on-campus informing of personalized events of interest. The campus should utilize Internet of Things solutions to optimize service experience, such as easing parking by communicating of free parking spaces and optimizing the resources spent on cleaning by measuring the amount of dust.

4.1.2 Delphi round 2 and 3 results

After the interviews were completed the material was analyzed and processed into claims regarding the digitalization of HE and changes in operational environment relevant to the subject. The panelists were asked to evaluate all claims on the dimensions of **desirability** and **probability** on a scale of 1-4 with an option of "no judgement". The evaluation scales of dimensions are presented in tables 4.6 and 4.7. The claims were divided by theme to 10 categories which included teaching and learning; organizational structures and development supporting digitalization; financial issues regarding digitalization; stakeholder collaboration; societal impact; academic community; openness and accessibility; physical campus; structural development of HEIs; and digital systems. The themes featured a varying amount of claims with teaching and learning having the largest amount (23) and academic community having the least (2) claims.

Table 6. *Scale of desirability*

Desirability (effectiveness or benefits)		
1	**Very Undesirable**	• Will have a major negative effect • Extremely harmful • Not justifiable
2	**Undesirable**	• Will have a negative effect • Harmful • May be justified only as a by -product of a very desirable item, not justified as a byproduct of a desirable item
3	**Desirable**	• Will have a positive effect and little or no negative effect • Beneficial • Justifiable as a by -product or in conjunction with other items
4	**Very Desirable**	• Will have a positive effect and little or no negative effect • Extremely beneficial • Justifiable on its own merit
0	**No Judgement**	

Table 7. *Scale of probability*

Probability (practicality)		
1	**Definitely Improbable**	• All indications are negative • Unworkable • Cannot be implemented
2	**Improbable**	• Some indication this is unworkable • Significant unanswered questions
3	**Probable**	• Some indication this is implementable • Some R&D still required • Further consideration or preparation to be given to political or public reaction
4	**Definitely Probable**	• No hindrance to implementation • No R&D required • No political roadblocks • Acceptable to the public
0	**No Judgement**	

The claims and possible supporting arguments formed the contents of the second round of Delphi. The round 2 of Delphi was conducted 2016-06-08 – 2016-06-14 after which the answers of the second round were processed for round 3 which resulted to some new claims. The arguments and average values of desirability and probability of round 2 were informed to panelists for the third round to promote creation of new relevant arguments. The third round was conducted 2016-06-15 – 2016-06-28 after which the acquisition of data from the Delphi panel was completed.

All of the results of Delphi round 2 and 3 are presented in Appendix 3 due to the extensive length of the data. **It is imperative to note** that the most important results of this thesis reside in these results of Delphi with the claims about the future, the desirability and probability of the claims and arguments on why panelists have taken a stand as they have. All readers that wish to utilize the results of this thesis to HE development should first and foremost consult to Appendix 3.

An overview of the results is presented in tables 4.8-4.10. Readers should consult Appendix 3 to match the results to the claims.

Table 8. *Mean values of Delphi round 3 ranked by the product of desirability and probability.*

Claim no.	Desirability * probability	Claim no.	Desirability * probability
56	12,84	**18**	9,35
3	12,82	**33**	9,34
68	12,54	**8**	9,23
49	12,37	**28**	9,18
5	11,82	**32**	9,13
70	11,67	**44**	9,13
46	11,59	**25**	9,08
59	11,47	**9**	9,08
19	11,37	**2**	9,07
20	11,16	**34**	9,03
66	11,09	**62**	9,03
72	11,05	**15**	8,99
1	11,04	**39**	8,98
23	10,94	**41**	8,98
29	10,80	**21**	8,65
71	10,75	**36**	8,53
30	10,73	**37**	8,53
64	10,66	**17**	8,41
10	10,63	**14**	8,37
67	10,63	**26**	8,33
38	10,51	**51**	8,22
27	10,46	**7**	8,14
45	10,44	**12**	8,07
16	10,38	**63**	7,89
50	10,13	**40**	7,66
53	10,12	**61**	7,64
35	10,00	**48**	7,61
6	9,97	**13**	7,56
69	9,69	**42**	7,38
60	9,63	**54**	7,34
31	9,52	**47**	7,15
65	9,52	**43**	6,85
52	9,50	**4**	6,40
11	9,47	**55**	6,23
22	9,47	**24**	6,18
57	9,43	**58**	5,53

Table 9. *Mean values of Delphi round 3 ranked by desirability.*

Claim no.	Desirability	Claim no.	Desirability
70	4,00	**8**	3,41
5	3,94	**34**	3,41
46	3,94	**45**	3,41
64	3,94	**57**	3,41
3	3,82	**60**	3,41
49	3,82	**62**	3,41
53	3,82	**2**	3,35
59	3,82	**11**	3,35
10	3,76	**22**	3,35
25	3,76	**31**	3,31
56	3,76	**26**	3,29
67	3,76	**36**	3,29
69	3,75	**37**	3,29
27	3,71	**28**	3,25
19	3,65	**14**	3,24
20	3,65	**48**	3,24
23	3,65	**65**	3,24
30	3,65	**17**	3,18
38	3,65	**40**	3,18
66	3,63	**51**	3,18
9	3,59	**12**	3,12
50	3,59	**15**	3,12
52	3,59	**18**	3,12
68	3,58	**47**	3,12
71	3,58	**63**	3,12
72	3,58	**21**	3,06
6	3,53	**43**	3,06
16	3,53	**42**	3,06
29	3,53	**24**	3,00
32	3,53	**4**	2,94
33	3,53	**7**	2,82
44	3,53	**61**	2,76
35	3,47	**13**	2,47
39	3,47	**54**	2,35
41	3,47	**55**	2,35
1	3,41	**58**	2,29

Table 10. *Mean results of Delphi round 3 ranked by probability.*

Claim no.	Probability	Claim no.	Probability
68	3,50	**60**	2,82
56	3,41	**67**	2,82
3	3,35	**57**	2,76
1	3,24	**61**	2,76
49	3,24	**2**	2,71
19	3,12	**8**	2,71
54	3,12	**64**	2,71
72	3,08	**17**	2,65
13	3,06	**33**	2,65
20	3,06	**34**	2,65
29	3,06	**52**	2,65
45	3,06	**53**	2,65
66	3,06	**55**	2,65
5	3,00	**62**	2,65
18	3,00	**12**	2,59
23	3,00	**14**	2,59
59	3,00	**32**	2,59
71	3,00	**36**	2,59
16	2,94	**37**	2,59
30	2,94	**39**	2,59
46	2,94	**41**	2,59
65	2,94	**44**	2,59
70	2,92	**51**	2,59
7	2,88	**69**	2,58
15	2,88	**9**	2,53
35	2,88	**26**	2,53
38	2,88	**63**	2,53
31	2,88	**25**	2,41
6	2,82	**40**	2,41
10	2,82	**42**	2,41
11	2,82	**58**	2,41
21	2,82	**48**	2,35
22	2,82	**47**	2,29
27	2,82	**43**	2,24
28	2,82	**4**	2,18
50	2,82	**24**	2,06

The differences between the mean values of evaluations had mostly very little variation by dimension. The average evaluation of 65 of 72 claims were between desirable and very desirable and 59 of 72 claims were evaluated between improbable and probable. The results are first presented as the product of desirability and probability to highlight the differences between evaluations and underline the results that were evaluated both highly desirable and highly probable.

The desirability of claims could be described as a dimension of what the panelists wish to happen and probability could be described as a dimension of how realistic the panelists

feel the claims to be. For decision makers, the desirability of claims could therefore be described as a more important dimension. The probability of realization of claims is after all only up to the decision makers. The probability dimension however also selves an important purpose by communicating possible issues in implementation of the claim by means of both the numerical evaluation and qualitative arguments.

The desirability of almost all of the claims is evaluated higher than the probability with only 6 claims being evaluated more probable than desirable. All of these claims rank lower than 3 in mean desirability.

The desirability and probability should however not be compared between categories as the dimensions are valued very differently. One of the characteristics provided for evaluating probability as 2 (improbable) was 'significant unanswered questions'. The proposed claims were described very shortly to ensure them to be unambiguous. This naturally leaves room for many unanswered questions.

The claim that was rated highest from the category of products of both desirability and probability regarded the increasing symmetry of information with development of digitalization. The claim predicts that any quality differences between HEIs will be clearer to students when choosing their HEI as the amount and accessibility of information increases. If this development will materialize as predicted, it is likely that HEIs will take means for stronger profiling based on institutions' strengths and weaknesses. The same claim was also rated second highest in the dimension of probability.

The claim evaluated second highest accounting for both desirability and probability regarded the utilization of students' mobile devices in teaching. Most students of today own smartphones and laptops that could be utilized in contact teaching. The utilization of technological devices naturally does not improve teaching and learning in itself but also requires pedagogically sound solutions. The claim was also rated third highest when accounting only for probability.

The limiting structures of Finnish HE was rated third highest when accounting for both desirability and probability. The claim was added for third round from a request by a panelist resulting to a bit different structure than most claims. The claim was also evaluated only by 12 panelists that participated in the third round whereas 17 panelists participated in the second round. The claim proposes that Finnish HEIs should have more freedom in structures when organizing as institutions to ensure competitiveness on an international level. The claim was rated the most probable of all claims when accounting only for the probability dimension.

When accounting for only the desirability dimension, a claim regarding the requirements of academic leadership was rated highest. The claim proposes that academic leaders should be both professionals in leadership and management and also make the academics feel comfortable in the same time. The challenge of finding or training such talent is also

noted in the claim. The claim was added for the third round of Delphi resulting to 12 panelists partaking in its evaluation whereas most claims were evaluated by 17 panelists.

Three claims were evaluated with the same mean value resulting to a split second position between the three. The first of the three claims regarded collaboration with other HEIs in producing online education as producing good quality online content demands a lot of resources. Since many HEIs globally teach the same content and have similar learning goals, collaboration would most likely produce financial savings. The second of the three concerned promoting openness, availability and accessibility of data in data policy. The importance of openness and accessibility of data was overall underlined as very valuable. The third and last concerned setting the main goal of the digital campus to be on excellence in user and service experience. The development of user-centered solutions in technology should be harnessed to development of higher education and the services linked to it.

5. CONCLUSIONS AND DISCUSSION

This thesis investigates the digital campus of Tampere3 in 2030. The aim of the thesis is to find solutions to minimize the negative effects of the physical distance between campuses and to support the goals of Tampere3 such as enhancing cross-disciplinary cooperation, achieving economies of scale in administrative costs, and increasing collaboration with stakeholders operating outside of HE system. The thesis also investigates other trends that should be accounted for in creating a future-proof HEI, and researches the current state of affairs regarding the digitalization of HE/R. The results are aimed to be utilized in the planning and execution of the digitalization strategy of Tampere3, but the results are generally applicable to other HEIs besides Tampere3, as the results are not region-specific.

For the most concrete results on the development of digitalization of HE, readers should consult Appendix 3. Even though there were some differences between the desirability and probability of suggested claims of the future, nearly all of the claims were evaluated to be either desirable or very desirable future scenarios. Also, nearly all of the evaluations of probability landed between improbable and probable but with most of the evaluations rounding up as probable scenarios. The differences between evaluations are very small and should not be regarded as the only criterion in deciding whether to pursue the claim or not. The arguments provided by panelists (Appendix 3) provide further information on the evaluations of the claims and are also imperative to be considered in the planning of the digitalization of HEIs. Naturally the decision makers should also use their own discretion in selecting what kind of future they wish to pursue.

In addition to predicting the future of digitalization in Tampere3, the research also explored the current state of affairs regarding digitalization. Both the Delphi panelists and participants of the workshop on the digitalization of education highlighted many positive aspects in the present day level of digitalization. All of the data obtained however points to the fact that Finnish HEIs still have a lot of work to do regarding digitalization. There were no indicators of satisfaction to the overall level of digitalization or the pace of harnessing digitalization.

Both describing the current state, and predicting the future of digitalization implicated that the academic community and stakeholders seem to mostly view digitalization as a phenomenon, instead of a somewhat generic view of perceiving it only as a process of digitization. This is an important result as one of the most demanding aspects of transforming HE to a digital era is in transforming the mindset of the academic community to cope with rapid changes and to adapt to new forms of operations.

5.1 Regarding the futures research

The Delphi method consisted of three iterative rounds of which the first round was an interview, and the later rounds were electronic surveys consisting of claims about the future of Finnish HE or Tampere3. The claims to be evaluated resulted from the interview round of Delphi. The researcher attempted to account for as many claims as possible, which could be derived from the interviews. As the means of evaluation are quite homogenous, it can be argued that the profile of panelists was possibly too homogenous, since the produced claims regarding the desirability received very positive evaluations overall.

The probability of the proposed claims was categorically evaluated lower than the desirability. It could be argued that the panelists do not expect HEIs to achieve their full potential on desired development trends. Only one of the means of the claims rounds up to definitely probable. However, the mean probability of 63 of 72 claims round up to probable over improbable.

A fourth iterative round would likely have been useful in providing even more relevant arguments, but was not possible due to the vacation period in Finland, which would have most likely dropped the response rate by a large margin. The average evaluations of desirability and probability were however quite consistent between rounds 2 and 3 and more iterative rounds would likely have only converged the averages.

Feedback from the Delphi was also collected from the panelists after the third round. Only three panelists left feedback. The small amount of feedback possibly resulted from the length of the survey that might have left the panelists too tired to come up with, and to leave feedback. One of the pieces of feedback regarded the survey tool itself, which was not satisfactory to the panelists. The survey tool was not satisfactory to the researcher either and will not be used again if possible. One piece of feedback concerned the change of language to English in rounds 2 and 3, and suggested that some of the claims were ill-defined. The change of language was done due to acquiring a non-Finnish panelist. The ill-defined claims were a problem of the schedule of the researcher, as there was no time peer review the claims before sending them to the panelists. The last feedback regarded the total workload of the process which was felt to be higher than expected. The estimated workload that was informed to panelists was an interview of max. 3 hours and a few hours for the iterative rounds. The iterative rounds likely took more time than estimated due to the extensive amount of claims realized from the interview material. Since the process took more time than expected, it is likely that the panelists did not have enough of time or energy to concentrate on the whole survey process, resulting to the loss of responses and/or arguments.

The Delphi results especially highlight the global market, collaboration and open data aspects regarding the university futures scenarios explored in chapter 2. The panelists either recognized a strong trend of competition between HEIs and the need for Finnish

HEIs to improve their attractiveness in a global scale, or based their views on the missions of HEIs. Online presence was highlighted as an important factor in both education and research. The growing demand for complementary education was highlighted as a problem that digitalization will ease with its nature of modularity and scalability.

Openness, availability and accessibility of data was more or less underlined by all the panelists as a central trend in HE. The policies of openness, availability and accessibility of data were seen as critical success factors for HEIs in the future.

The collaboration of HEIs between themselves and with external stakeholders was also predicted to grow in importance to any institutions that wishes to achieve global success and attractiveness. The collaborative aspect was also highlighted as a source of income and financial savings in times of decreasing public funding.

5.2 Regarding Communities of Practice

Even though communities of practice were not discussed per se in the Delphi research, the central characteristics of a CoP were discussed separately with the panelists in the interviews. The characteristics are domain, community and practice.

The first central characteristic, domain, refers to a common interest that links the community together. This aspect can be argued to materialize in an academic community as long as the selection of students is successful in measuring the suitability of applicants to the field of science. The aspect of student selection was not per se emphasized by the panelists. Regarding the domain of the HE staff, the interest towards the field of science is very likely to be true, as they have pursued a career in the field after graduating.

Communality, the second central characteristic, regards the shared activities of a community around a common domain. Enhancing communality by means of digitalization was a recurring theme highlighted in the Delphi interviews, and utilization of technology was regarded as an important factor in the enhancement of communality, by lowering the threshold of participation and enabling participation independent of time and distance. Academic communality was unanimously highlighted as one of the most important aspects of future HE, both inside the groups of staff and the students, as well as between the two.

The third and final of the central characteristic of CoPs, practice, refers to the actions of the members in the community regarding the domain, and to learning from the community through practice. As academic work mostly revolves around teaching and research, the practice also revolves mostly around these themes. HEIs are institutions for transferring knowledge through teaching, and creating new knowledge through research.

CoPs can materialize in a HEI setting either inside the groups of staff and students, or between the groups. It is however debatable whether CoPs between staff and students or

between just students can actually become common, as CoPs are sometimes described to take several years to be formed. The students do, however, spend four or more years in higher education which enables the forming of CoPs including students, even with the demand for many operative years.

The CoPs between students are likely to form inside the fields of science that students have been selected for, or between fields of science but with similar interests and subjects that are learned and researched. The main challenge for CoPs to materialize in student groups is the quick rotation of students, as they generally only spend several years in HE. The CoPs of students are therefore most likely to form around organizations such as science clubs or other student organizations that are formed on the basis of a field of science. Organizational memory can patch the challenges caused by quick rotation, resulting in the lack of true old-timers in the CoP.

CoPs between students and staff are likely to form. Students are first learning from the old-timers of the field of science, then gradually end up working for the faculty or department, first as a temporary or part-time employee, then later as a full-time employee while pursuing a postgraduate degree and starting to build their academic career. This cycle describes the renewal in the CoPs consisting of only academic staff as well. Another relevant scenario for CoPs between students and staff, is the utilization of co-creation methods in the development of teaching and learning.

Most of the panelists argued that the role of teachers will develop into more of a facilitator or mentor of learning. Considering the panelists' unanimous view that communality is a rising trend in HE, and the views of panelists on the future requirements of HE teachers, an increase in the CoP type of teaching and learning is a likely scenario. CoPs are however defined in such particularity that the result may be some other type of modern learning paradigm.

5.3 Closing words

Naturally the research conducted does not provide all the necessary solutions to a digital leap in higher education, or answer all the relevant questions regarding the digitalization of Tampere3. Many new intriguing research questions arose from the results, however.

Further research of all the themes explored in the futures research of HE would be beneficial. With the limitations of an appropriate workload, this research only scratches the surface of the themes. This can however also be regarded as a positive aspect as it gives Tampere3 and other interested institutions leeway to find an institution-specific solution.

As almost all of the future claims suggested in the Delphi resulted in very positive results regarding their desirability, it would be very interesting to further investigate which ones

are most potent in the context of Tampere3, and how the management of the new institution selects which ones of the proposed goals and operations to pursue.

These are however research subjects for a different project and a different time. I wish Tampere3 and all other HEIs the best of luck in adapting to the digital era. The adaptation process will most likely be the toughest one in the history of HE as the pace of changes in the operational environment is accelerating. However, adaptation is imperative, or HE as we know it, will likely cease to exist.

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APPENDIX 1: COVER LETTER FOR DELPHI PANELISTS

Dear recipient,

thank you for your interest to participate in a research project regarding the digital campus of Tampere3 university. This document briefly describes the contents and goals of the research and contains some preparatory material for the interviews. In addition to the brief orientation material links for further reading are provided in case you are interested in reading more about the subject.

GENERAL INFORMATION ABOUT THE RESEARCH

The goal of the research is to define the hopes and expectations of the members of higher education institutions and essential stakeholders regarding the future digital campus of Tampere3. The digital campus should support all missions of Finnish higher education institutions, which include higher education, research and development and societal and regional impact. The target horizon is set to the year 2030. The results of the research will be utilized in the planning and implementation of Tampere3 process according to the discretion of the strategic and operative management of the process.

The methodology of the research is Delphi, a futures research method. The method consists of several iterations starting with a semi-structured in-depth interview and continuing as a questionnaire in the further rounds of iteration. The content of the sequential round is defined by the results of the previous rounds, e.g. the first questionnaire round will be based on the contents of the in-depth interviews. In the questionnaire rounds the panelists are asked to evaluate statements and scenarios and suggests changes to the statements and scenarios. The goal of the iteration rounds is not to achieve consensus among participants but to find out all the relevant arguments regarding the research area. The amount of iterations after the interviews is usually 1-3 rounds. The response time for the questionnaire forms is around one week.

The Delphi method is based on anonymity of the respondents. All participants can express their views and opinions freely without having to worry about branding or judgement by others. The list of participants will be published in the thesis and told to other panelists if the all of the participants agree, but the arguments and opinions will be presented anonymously. The interviews will be recorded if the participants agree. The records and responses to questionnaires will only be available for the researcher and used only for the research currently conducted. The recordings and questionnaire responses will be destroyed after the research.

The participants can be roughly divided to three categories: members of the academic communities of Tampere3 higher education institutions, members of other relevant higher

education institutions, and external stakeholders. The participants are chosen by the researcher and the supervisors of the research. A representative sample of different sexes, nationalities and age groups is targeted in the composition of panelists.

The research is conducted by Jussi-Pekka Teini (jussi-pekka.teini@tut.fi, 040 7059755). The supervisors of the research are Professor Petri Nokelainen and Lecturer Risto Mikkonen. The researcher and supervisors are all employed by Tampere University of Technology. The research is ordered by Tampere 3 Director Päivi Myllykangas.

THE DIGITAL CAMPUS OF FINNISH HIGHER EDUCATION IN 2030: CASE TAMPERE3

The most significant trend in the development of present day society is digitalization. Digitalization is expected to disrupt our society in every aspect with education and higher education being no exception.

The changes in technology and utilization of technology from 2000 to present day

Looking back 16 years from today to the year 2000 the higher education institutions were quite different from today. Information was produced and consumed mostly in the forms of physical books and journals. The computational power of computers was quite primitive and the smartphones of today have much more computational power than an average tabletop PC of 2000. The internet connections for consumers were dial-up connections and transferring large amounts of information such as videos demanded huge amounts of time. Computer assisted modelling and computing were elementary compared to present day. In higher education distance learning consisted mostly of correspondence courses while today MOOCs (massive open online course) are mundane.

The society has also changed a lot outside of higher education institutions in the last 16 years. The internet has revolutionized our society by making huge amount of information available for almost everyone and by creating new ways of networking such as advanced social media. The internet has also revolutionized the market economy with aggregators such as Alibaba, AirBnB and Uber. The education market also has some aggregators such as Coursera and edX.

Megatrends have a comprehensive effect on the development of our society. The megatrends of 2016 identified by Sitra consist of digitalization, globalization and crisis of sustainability. The research at hand is focusing especially on digitalization, but the other megatrends are also affecting our higher education system by changing operational environment. A good example of this is the globalization of higher education which has mostly been enabled by digitalization.

Predicting technological development and the utilization of technology in 2030

Predicting the future is very challenging. People tend to project present day developments to distant future since the dynamics of societal changes is very difficult if not impossible

to predict accurately. A common human attribute is to underestimate the amount of change when predicting distant future and overestimate the amount of change when predicting near future. These human attributes cannot be completely avoided, but it is useful to recognize them. Setting the reference point to 2030 should minimize the previously mentioned human attributes.

When predicting the digital campus in 2030 multiple factors need to be considered with direct and indirect effects in higher education, such as

- **Financing of higher education:** how will the amount of financing for higher education develop and where will the financing come from?
- **Level of education:** what percentage of the Finnish population should attend higher education in 2030?
- **Development of technology:** will disruptive technologies emerge regarding higher education? What kind of possibilities would e.g. utilization of virtual reality, augmented reality, big data and learning analytics provide to higher education? Will there still be a need for a physical campus in 2030?
- **Globalization of higher education:** how will the globalization of higher education affect the demand and supply of higher education? How can we succeed in the global education market? What will be the main languages of education in 2030?
- **Amount and availability of information:** how will the availability and reachability of information develop? How will big data affect the development of higher education institutions?
- **Changes in the labor market:** what kind of skills, competences and knowledge should higher education provide towards 2030?
- **Service experience:** what kind of demands does globalization of higher education set to service experience in our higher education institutions?
- **Political governance:** how will the autonomy of higher education institutions develop? Will political governance advance or hinder the necessary changes in higher education?
- **Internationality:** how will the internationalization and international cooperation of higher education institutions develop towards 2030?
- **Academic work:** will there be freedom of research in 2030? How will universities develop as workplaces?

Additional information on the trends of higher education

OECD:

- CERI - University Futures: Four scenarios for Higher Education: http://www.oecd.org/edu/skills-beyond-school/42241931.pdf
- Six Scenarios for Universities: http://www.oecd.org/edu/skills-beyond-school/36758932.pdf
- University Futures and New Technologies: Possibilities and Issues: http://www.oecd.org/edu/skills-beyond-school/36758866.pdf

- What is changing in Academic Research: Trends and Futures Scenarios: http://www.oecd.org/edu/ceri/37481256.pdf

European Commission:

- Higher Education and Research for the Era: Current Trends and Challenges for the Near Future: ftp://ftp.cordis.europa.eu/pub/foresight/docs/hleg_final25102002_en.pdf

APPENDIX 2: DELPHI INTERVIEW FRAMEWORK

Interview framework

General

1. Name
2. Title
3. Organization
4. Sex
5. Age
6. Notable connections to Tampere3 higher education institutions, for example member of an academic board

Present state of digitalization

1. How would you describe the current level of digitalization and digital infrastructure in Tampere3 or in Finland more generally? What aspects of it already work well and what should be especially developed?

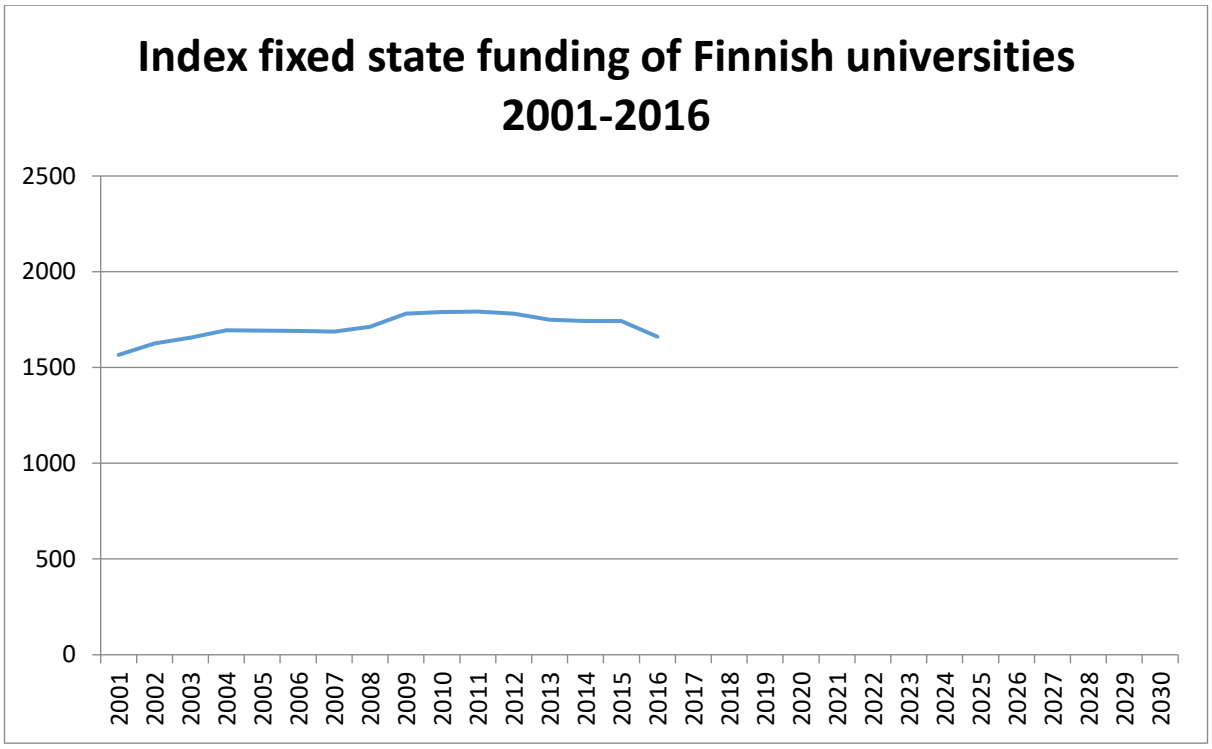
Higher education system trends towards 2030

1. Public university funding 2001-2030 (appendix 1). How will the funding base of higher education develop towards 2030? Will there be more funding from the private sector (co-operation with industry, tuition fees etc.)?
2. Will digitalization of higher education result to savings, i.e. will higher education institutions be able to provide the same level of education with less resources?
3. How will the level of education in Finland develop towards 2030?
4. How will the value of formal higher education degrees develop towards 2030?
5. How will the international cooperation of higher education institutions develop towards 2030? How will the globalization in supply and demand affect higher education?
6. What kind of skills, competences and knowledge should higher education institutions provide in the future?
7. What kind of changes should be made to the service experience of higher education when competing in the global education market?
8. How will the autonomy of higher education institutions in Finland develop towards 2030? How will the political control of research and higher education change?
9. How will the demand for further/continuing education develop towards 2030?
10. How will working in an academic environment change towards 2030?
11. Will higher education be drastically changed by some disruptive technology towards 2030 (e.g. virtual reality, augmented reality, utilization of big data and learning analytics)?
12. What kind of challenges does privacy and data protection set to digitalization of higher education?
13. How will the openness and availability of data and information develop towards 2030?
14. How will the academic community develop towards 2030?

Digital campus in 2030

1. What kind of digital campus should there be in the Tampere3 university in 2030? What are the most crucial characteristics necessary for creating a digital campus? What kind of steps are necessary in order to achieve the goals?

Appendix 1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APPENDIX 3: DELPHI ROUND 2 & 3 RESULTS

After the interviews were completed the material was analyzed and processed into claims regarding the digitalization of HE and changes in operational environment relevant to it. The panelists were asked to evaluate all claims on the dimensions of desirability and probability on a scale of 1-4 with an option of "no judgement". The claims were divided by theme to 10 categories which included teaching and learning; organizational structures and development supporting digitalization; financial issues regarding digitalization; stakeholder collaboration; societal impact; academic community; openness and accessibility; physical campus; structural development of HEIs; and digital systems. The themes featured a varying amount of claims with teaching and learning having the largest amount (23) and academic community having the least (2) claims.

The claims and possible supporting arguments formed the contents of the second round of Delphi. The round 2 of Delphi was conducted 8.-14.6. after which the answers of the second round were processed for round 3 which resulted to some new claims. The arguments and average values of desirability and probability of round 2 were informed to panelists for the third round to promote creation of new relevant arguments. The third round was conducted 15.-28.6. after which the Delphi was complete. A fourth iterative round would probably have been useful in providing even more relevant arguments but was not possible due to the vacation period in Finland which would have most likely dropped the response rate by a large margin.

All claims on desirability and probability were answered by all 17 respondents of round 2 and by all 12 respondents of round 3 except for:
Claim 21: 16 respondents on desirability
Claim 28: 16 respondents on desirability
Claim 31: 16 respondents on both desirability and probability
Claim 43: 16 respondents on desirability
Claim 66: 16 respondents on desirability
Claim 69: 11 respondents on probability

Claims 68-72 were added to the questionnaire for the third round from the suggestions of panelists in the second round. Panelists were able to suggest new claims after each theme. Claim 34 was a duplicate claim of claim 33 and was therefore removed from the results.

It should be noted that the arguments provided are not presented in a chronological order. The digital survey tool utilized in this research did not support an option to sort the responses chronologically.

The panelists were asked to evaluate the claims on the dimensions of desirability and probability.

Desirability (effectiveness or benefits)	
1 Very Undesirable	• will havea major negative effect • extremely harmful • not justifiable
2 Undesirable	• will have a negative effect • harmful • may be justified only as a by -product of a very desirable item, not justified as a byproduct of a desirable item
3 Desirable	• will have a positive effect and little or no negative effect • beneficial • justifiable as a by -product or in conjunction with other items
4 Very Desirable	• will have a positive effect and little or no negative effect • extremely beneficial • justifiable on its own merit

Probability (practicality)	
1 Definitely Improbable	• all indications are negative • unworkable • cannot be implemented
2 Improbable	• some indication this is unworkable • significant unanswered questions
3 Probable	• some indication this is implementable • some R&D still required • further consideration or preparation to be given to political or public reaction
4 Definitely Probable	• no hindrance to implementation • no R&D required • no political roadblocks • acceptable to the public

The panelists were also provided with instructions to provide arguments and new claims whenever they see fit.

Delphi round 2 and 3 results by theme

Theme 1: Teaching and learning

1. All students should be engaged in collaborative online learning to pursue virtual team working skills

Virtual team working skills are an essential competence in the future and should be included in the curriculum of all students.

Round 2: Desirability average: 3.44, probability average: 3.25

Round 3: Desirability average: 3.41, probability average: 3.24

Arguments regarding previous claim:

- 3 on the desirability, because these kinds of methods can't be the only ones.
- Might / should be included in some fields, but not in all.
- Should be engaged but not *only* online learning.
- For majority of professions, incl. most research work, virtual teamwork skills are a necessity even now, and collaborative online learning is likely to be implemented in most curricula, in one way or another. However, if implemented badly, face-to-face study or even lectures are better, and even if virtual teamwork is becoming more and more important, there may be specialist professions where it does not play such as prominent role.
- Virtual teams is the way future "tietotyö" is going. Different applications and tools, not to mention the basic principles related to virtual working are therefore highly desirable. However, there are still some hindrances on the way, like unfinished applications and most of all un-qualified teachers.
- Unfortunately the current state of virtual teams and collaboration is not good. Factors for successful team work vary from virtual to f2f co-operation, and participants should understand how to operate in both worlds.
- The virtual team working skills required by different fields of expertise are quite different, which requires significant consideration during the implication of the claim.

2. The digital campus of Tampere3 should be based on Bring Your Own Device for both students and staff

The staff should have a complete freedom of choice on which basic devices to use in their work, such as selection of smartphones and laptops. The university should financially support the staff for purchasing their own devices instead of centralized procurement. Students should be required to own a mobile device able to run a certain list of programs and applications

Round 2: Desirability average: 3.31, probability average: 2.75

Round 3: Desirability average: 3.35, probability average: 2.71

Arguments regarding previous claim:

- Teachers are employees and the employer should provide relevant tools, own devices should be allowed instead of centralized procurement
- Might be too expensive to get support for large number of different types of devices.
- It is an open world and universities should keep the world open. A university cannot and should not be Microsoft, Apple or any other platform dependent.
- BYOD is fact with students. With staff this will not be possible with laptops, because licence cost would be far too high. In future that will be easier. With tablets and smartphones there are no/less problems.

- Standardization of staff devices will in many cases enhance support capabilities.
- I acknowledge that not everyone is prepared to invest their own time and money in tools that they use, but those that are should be supported in acquiring the most efficient tools for their own work. There are some cultural and practical hindrances, especially among teaching staff and faculty members. For students, there are no viable alternatives to BYOD, so it should be supported.
- With everything-as-a-service models ever increasing, how relevant are own personal workstations and workspaces? Everything already syncs "with the cloud" across all of my personal devices. Both the students and the staff have become familiar with this in their personal lives. When will the university catch up?
- It's unclear (and needs further investigation) whether it would be possible to *require* staff to purchase tools needed at work. I'd rather suggest that it would be a choice that is offered. In this case questions regarding information security and privacy should be considered, and a virtual desktop offered for cases when higher security is needed.
  It's self-evident though, that BYOD - and "Bring your own technology" - has to be enabled.
- The university should provide devices to those students that do now own the devices required. Otherwise the socioeconomic equality and accessibility of education will suffer significantly.
- While BYOD is common in the private sector, the university is large and extremely slow, bureaucratic and conservative: "It's expensive, it's a risk for information security" are likely given reasons on why this is not going to happen.

3. The mobile devices of students should be utilized in teaching

Most of the students have at least one mobile device (smartphone, tablet or laptop) that could be utilized in contact teaching.

Round 2: Desirability average: 3.75, probability average: 3.31

Round 3: Desirability average: 3.82, probability average: 3.35

Arguments regarding previous claim:

- Probability can be increased by putting a lot of effort to teacher training. Traditionally teachers are not naturally inclined to empower the students.
- Not always and everywhere, but where they fit. There is a strong pressure towards this from technology companies, and it should sometimes be resisted and at other times embraced.
- It has started with kahoot.and other similar low entry level apps. Soon after more "meaningful" apps will follow.
- Using a mobile device is just - using a mobile device, no more. More important is to decide and design *how* and in what situations they are used. Questions like 'How do "quick polls", "make questions & comments" promote learning' should be asked and answered.

  Mobile devices should be considered only as tools, and one has to consider the most effective ways to use them.
- See above.

4. Tampere3 should compete in the global education market with online education

The easiest way to globalize formal education is to provide it via internet. However, it is a very competed market and therefore requires a learning experience of very high quality.

Round 2: Desirability average: 3.25, probability average: 2.44

Round 3: Desirability average: 2.94, probability average: 2.18

Arguments regarding previous claim:

- Successfully competing in MOOCs is highly desirable. However, I need to emphasize the "SUCCESSFULLY" part of successfully competing. Bad learning experiences only work against Tampere3 and are a huge waste of resources
- This is one important way of "profiling". Should happen!
- MOOCs are not means for improving competitive advantage, unless we are able to invest millions in marketing and production. Even then the economical benefits are realized indirectly through brand building, not directly as increased incomes. At best, MOOCs are a mean for marketing education, not for making business.

  However, non-open online education programmes, which take advantage of our specific strengths are addressed to specific customer segments, are definitely desirable when we are exporting education worldwide. And not least due to the cost effective delivery model. We should not mix the concepts 'MOOCs' and 'commercialized online education' together.
- averages (respondents) are wrong in this. Tampere3 has precious walls and an ongoing community PRESENT day in, day out. Successful competition with agile startups in the field of purely online education is doomed. Tampere3 could produce a handful of world-class MOOCs, but it should be for a marketing only, not for direct revenue.
- When working with online strategy considerations should start from a global approach. Putting it into other words strategy building should not start from local conditions especially when dealing with online education. Globality needs to be taken into account.
- We don't have economical resources enough
- The competition will be global so it would be a mistake to not take that into account when strategy is considered. Then again - we should still concentrate on building a strong entity to the local market as well.
- In some limited cases, perhaps. This also depends on the infrastructure we can build to support online education, incl. startup companies. The focus should be more on cooperation than competition.
- "Do or do not. There is no try." We have the resources, if we want to. Few key areas to focus all the efforts on and let's build on that.
- The key word is "compete". As online education is useful, making it a competing factor is not good. We should concentrate on learning outcomes, not the forms how it happens.
- I'd rather say, that in the first place (years) Tampere3 should concentrate on building an attractive, high-spirited learning and research environment both inside and with collaborative institutions, and maybe later on spreading to a global market.

  It's a good question though, whether Tampere3 should excel in national or global level. One should not underestimate the national and local needs.
- There could be some specific academic fields where Tampere would be able to compete and succeed on the global market. However, I consider such areas rather limited. The risk of losing the large initial costs involved in setting up an online course is quite high.

  All in all, I neither prefer nor oppose the statement in question.

5. Tampere3 should strongly collaborate with other higher education institutions in producing online education

Producing high quality online education is very resource intensive. Both national and international collaboration should be strongly promoted in order to produce attractive, high quality online education.

Round 2: Desirability average: 3.81, probability average: 3

Round 3: Desirability average: 3.94, probability average: 3

Arguments regarding previous claim:

- Why not?
- We definitely need to be active in establishing and joining relevant value networks, as alone we simply don´t have the sufficient resources.
- Yes, this is a no-brainer. Even if the ministry funding model is implicitly against teaching collaboration.
- I often find myself thinking, after having participated in an online course by Stanford or Princeton, am I out of a job? How do I compete with these guys.
  There is only one answer, by collaboration with others and by embracing diversity.
- Collaboration and sharing are becoming very important aspects of Universities for universities when they are creating strategies for the future.
- I don't at the moment have very high hopes, but this is absolutely necessary if we want to create a high quality online education ecosystem in Tampere.
- As with the previous question, this is highly desirable. However, there are still political reasons why this might not happen: who pays what, who gets what, and (for god's sake) where should one allocate the hours put into this.
- With collaboration an institute can save resources both in largely common education and very specialized education (e.g. basic IT courses could as well be common, or infrequent language courses could be offered by a single institute etc.)

6. The role of teachers will transform to a mentor or facilitator of learning with blended learning and flipped classroom types of teaching becoming more common

Teachers no longer need to spend the contact teaching hours merely providing lectures with modern digital solutions such as video lectures. The contact teaching hours can therefore be spent on facilitating deeper understanding to what the students have studied beforehand.

Round 2: Desirability average: 3.56, probability average: 2.81

Round 3: Desirability average: 3.53, probability average: 2.82

Arguments regarding previous claim:

- Probable in the further future, but not in the close one. Requires a lot of practice to make this work.
- Takes time to change this, but it will happen gradually.
- There will be different roles for teachers
- This will change the focus to the learning skills needed in the digital world. For students and teachers as well.

- There are still some cultural hindrances, and changes are needed in the way how teaching staff and faculty perceive their roles and what is meaningful in the learning experiences.
- Already some of the teaching staff is using flipped classrooms and other such "modern" methods. Because of the results, this is highly desirable.
  This is a change that can't be forced on the educating staff (I think). It needs to come from the teachers themselves.
- Flipped classroom etc. does not fit every situation. That's why desirability is not full 4.
- This is a common prediction, but I think it will take quite a long time. Suggested methods require very much both from the teacher and the student - to such extent, that I do not thing it will happen in the basic courses. But the further the student is with their studies, the more desirable and probable this approach will be.
  In higher education the teacher still needs to be an expert in their own field to be able to properly mentor/facilitate/blend...

7. The role of teachers transforms from teacher to an administrator of information with the selection and delivery of study materials being a more central part of the job as amount of information is exponentially increasing

Round 2: Desirability average: 3, probability average: 2.88

Round 3: Desirability average: 2.82, probability average: 2.88

Arguments regarding previous claim:

- Probable in the further future, but not in the close one. Requires a lot of practice to make this work.
- The students need to have skills for acquiring relevant and rigor information. The teachers' role should be about guiding in this.
- Univ. teachers tend to be conservative in their methods. Hundreds of years of unwritten rules and structures in schools make change difficult (change in personality, that is).
- Yes the teacher will be a choice maker, but will not restrict the curiosity of the student
- Teachers should be able to encourage students in learning. Not administer it.
- Part of teaching will always be the curation of information content, but I hope this role will in the future be taken mostly by the students themselves. Teachers need to focus more on facilitating the development of capabilities that the students need in order to do it.
- While teaching is changing, a scenario where a teacher only administers and distributes information is not desirable. Teaching and learning are an active process which requires participation from both sides. A teacher which only delivers study materials is hardly active participation.
- Students should learn to find out information. Teacher can't be the only one providing information.
- Teachers have selected the information even before the digital age. An essential skill to develop for students is searching and analyzing information, and they cannot rely on that someone will pick the information for them.
- This could become a larger part of the role of a teacher. However, I would still prefer an option where teachers also tailor-make content for specific courses themselves rather than merely curating the work of others.

8. Instead of extensive use of flipped classroom, Tampere3 should aim for flipped campus

The campus should be a platform for deepening understanding in a social context. All studies that do not include social context should be available for studying online.

Round 2: Desirability average: 3.5, probability average: 2.75

Round 3: Desirability average: 3.41, probability average: 2.71

Arguments regarding previous claim:

- If the social context is not necessary, then why should it still be enforced? And with increasing pressure to get more people through the educational-tube, at least some of the studies are going to be possible to study completely online.
- "In addition to", preferably not "instead of".
- How I define "flipped campus" is that it actually improves the social aspect of learning, since the time on-campus/on-site is spent on such as meaningful discussions, team activities, authentic projects and so on, whereas the time off-campus/off-site is spent on building the basis of theoretical conceptual knowledge, which is then deepened on-campus/on-site through collaborative and authentic activities. The campus becomes the living lab of action and team based learning, in various forms.
- The aim should be high, even if the change is low probability.

- Nice idea
- I think the aim should be at providing enough diversity so that the campus would work in any different learning scenarios.
- Perhaps, but there are very few instances where the social context does not actually carry a significant meaning.
- Social context doesn't end where the walls do. What do the students get from weekly exercise session and lecture that they won't get from a pedagogically highly skilled mentor online? Again, this should be "in addition to" like one panelist said.
- I'm against since social contacs are mostly formed in informal situations. Therefore, it's impossible to define when social context is useful or not.
- "All" is very extensive word in this context. One probably still needs printed material or hands-on learning sessions.
  Social context exists also in good online studying environment.

9. Meriting in teaching should be a viable option in advancing in an academic career

At the moment, merits in research are valued by far over merits in teaching in advancing in an academic career. Ambitious academic staff will not invest in developing their teaching skills if it will not advance their career.

Round 2: Desirability average: 3.69, probability average: 2.69

Round 3: Desirability average: 3.59, probability average: 2.53

Arguments regarding previous claim:

- What makes the best MOOCs the best? It's not the research merits of the teacher teaching. Sadly, the current funding models don't support this.
- Its current requirement at TAMK, hopefully in future everywhere where its needed. There'll probably be courses that it is deemed unnecessary.
- Difficult to change, but can be done if there is enough organizational will to do so.
- Incentives in general, are an underutilized resource in HE, for promoting development on individual, team and organizational levels.
- Ah yes. Here I will change my opinion. I am sure the emergence of online platforms will see the emergence of specialized teachers: the prophets of online.
- Absolutely agree, except I'm not sure if it should be called advancing in an _academic_ career, or something else entirely. Anyway, focusing on teaching should remain a viable choice in higher education.
- It is sad to see such a large gap between desire and probability...
- Even now there is academic staff that want to be excellent teachers.

  Meriting is very important, as it's also a message from the senior management, that this is something that is valued and appreciated.
- Most definitely! The political and societal pressure for better quality education is certainly increasing. Students are also pressured to graduate faster - a goal that could very effectively be furthered by improving the quality of teaching.

10. Teaching in the digital era demands pedagogical competences.

With the utilization of technology-enabled teaching methods such as blended learning or flipped classroom, the teachers need to have skills in pedagogy. Pedagogical competences are especially important in providing online education in the global markets.

Round 2: Desirability average: 3.75, probability average: 2.88

Round 3: Desirability average: 3.76, probability average: 2.82

Arguments regarding previous claim:

- Latter.
- This relates strongly to the previous question. Pedagogical competence is highly desirable, but again sadly, the current funding models don't support this.
- Pedagogical competences were needed even pre-digital era, so no change in this. Of course understanding the blended learning environments and pedagogical methodology is needed.

11. The digital teaching and learning systems should be updated constantly with minor updates instead of sparse big updates to minimize the learning gap of users in an updated system.

Round 2: Desirability average: 3.44, probability average: 2.88

Round 3: Desirability average: 3.35, probability average: 2.82

Arguments regarding previous claim:

- updated constantly is a terrible harm, especially if it is administrated centrally. Teachers should have an option to decide when they want to update programs-
- Whenever this is possible, often it is not.
- A course is a product (or service) and should be treated as such. If it is appealing to the market one should invest in making it more lucrative.
- This requires somewhat big change in the IT department. Instead of focusing on large updates, the IT department should realize that the systems are never finished and they need constant improvement both in terms of new functionalities and fixing the old. Is Facebook going to be finished? Or Windows? Or iOS?
- Not only to minimize the learning gap but also to ensure cost-efficient development.

12. Tampere3 should provide free open university studies for secondary education graduates without long studies of natural science to make them applicable to degree programs in science, technology and medicine.

Many students opt out of long tracks of mathematics, physics and chemistry in choosing their secondary education. Tampere3 should provide a chance for these students to fill the gap between their competences and the requirements for applying to degree programs requiring competences in natural science

Round 2: Desirability average: 3.13, probability average: 2.63

Round 3: Desirability average: 3.12, probability average: 2.59

Arguments regarding previous claim:

- Excellent idea, but once again, money comes on the way. With enough funding, why not?
- This would be an investment for the sake of the most suitable students. But it is an investment that is hard to make, as there is no direct and fast feedback. It should be done, but I don't see it happening.
- Free and open requires better quality, better planned material and screenwritten videos. That increases costs remarkably. It is possible only in co-operation with other universities.
- "Free" should be distinguished from "without student having to pay for it". But yes, everyone should be able to take part in open university courses with little or no cost.
- Well why not? Why do you need to get "qualified" from high school? If you can get the necessary qualifications, then sure, come in and study.

- A good idea that also promotes life-long (continuous) learning. Not necessarily free, a decent cost would be good enough.
  Even a minor cost probably encourages students to finish the course, not only to start.
- I would widen the scope of fields of study to cover as many fields as possible. In general the strict division between secondary and higher education needs to be - and most likely will be - questioned.

13. The degree of sophisticated technology used in contact teaching is irrelevant as long as the teachers are pedagogically qualified.

The teachers should continue to have a freedom of choice on what equipment to use in contact teaching, whether it is a blackboard, overhead projector or something more modern.

Round 2: Desirability average: 2.44, probability average: 3

Round 3: Desirability average: 2.47, probability average: 3.06

Arguments regarding previous claim:

- If world goes forward, teaching needs to do the same. How can we ever be relevant to the current world if we are 30 years behind?
- I did not understand the question.
- In principle, teacher freedom is good. But it cannot lead to "ridiculous learning environment" for the students. Many time teacher freedom is interpreted as such. Teachers should see themselves as magnificent ambassadors of their organization, not (only) as researchers of their discipline.
- changed my opinion. Do not really understand the question
- Are they? Is it enough in mass courses or in general level in modern society?
- I wouldn't pit teaching qualifications against the use of sophisticated technologies. The teachers should be capable to follow their times. Though, personally I have no problem with someone (not everyone!) sticking to their trusty blackboards and transparencies, as long as their teaching remains relevant.
- Compared to the current situation, the biggest change is "as long as the teachers are pedagogically qualified." An excellent teacher doesn't need anything else than his/her voice and a blackboard. This should go both ways: teachers should be able to use whatever they want: ie. the university shouldn't prohibit from using something just because it's "not supported" or something.
- Some cost-efficiency is needed, so a full freedom of choice is probably not even possible. The university should be careful with this, as "freedom of choice" should not be synonym for "the only equipment that I can use". Consistent educating of teachers of the suggested equipment is needed to ensure required skills.
- This option is certainly very probable, if not desirable to all.

14. Tampere3 should produce high quality video material for teaching purposes.

High quality teaching videos are very resource intensive compared to recorded lectures or traditional lectures; they need to have relevant content, to be scripted and to be pedagogically good.

Round 2: Desirability average: 3.25, probability average: 2.56

Round 3: Desirability average: 3.24, probability average: 2.59

Arguments regarding previous claim:

- A tested system at TAMK on few courses, works miracles. Allows for repeated learning sessions of same areas.
- Whenever we aim at building our brand, there should be no compromises with regard to quality. In any sense.
- Teaching videos should be considered "disposable". High quality is produced by BBC in "Avara

luonto".

- For a Hollywood movie (good quality?) you need a global audience. Videos need to be good enough, better than present.
- This in possible in basic sciences f.ex. in mathematics but it requires co-operation between universities.
- High (technical) quality of video is not necessary for the YouTube generation.
- High quality of videos is important, although teachers and students, as well as researchers should be able to create quick and simple videos as well, when needed. Depends on the purpose of the videos.
- As with the online teaching: "Do or do not. There is no try." Bad videos only work against themselves.
- The focus in this should be selected - as mentioned, resources are need, and they are costly. The resources should be put to courses and material that is widely used (like elementary courses) for several years.

15. Higher education institutions should provide education using software that businesses use as well.

For example, accounting should be learned by using a professional accounting software.

Round 2: Desirability average: 3.13, probability average: 2.94

Round 3: Desirability average: 3.12, probability average: 2.88

Arguments regarding previous claim:

- It also aids the co-operation with businesses. Also a used practice at TAMK on few educations.
- These tool, not ends. If it works well, then yes.
- Where applicable, it is highly desirable. E.g. Computer Science students should you GitHub in their studies.
- In universities of applied sciences we teach future professionals. A professional can be identified through an understanding of theory and tools. If a bachelor in marketing does not know how to implement a marketing campaign with modern it tools, what have we taught him?
- In most cases yes but new things come from universities for example email came to Finland first in universities from where it spread to society. Despite that universities shouldn't use tools which are out of date or marginal
- Yes, although we have little way of knowing which software will still be used in businesses (not all the businesses use same tools) when the students who start their studies now graduate. Getting stuck with some specific piece of software is never a good idea. Teaching should focus on more generic paradigms of tools, with practical examples and projects using latest current tools.
- There is a gazillion software available to accomplish different things. It's not feasible to presume that the classes could teach all or even the most relevant ones. However, as the underlying theory is the same so are the very basic principles behind the different software. Therefore it might be beneficial to teach with the same software that is in use in business.
- The tools are not as important as understanding. Tools are made on certain idea; if this is the only one learned, improvements are impossible. Using only one tool is then not a good idea; using several tools using a little bit different background is OK, but might appear expensive and hard to apply in practice.
- Each and every student should learn to cope with changing tools and software. Naturally same software should be used, but other as well (when applicable). No student should graduate thinking that they are using the same version of the same office software all the coming years.

16. The Finnish higher education institutions need to enhance the ease of access for

open university and continuous/further education courses.

Higher education competing in the global markets, such as MOOCs, are very easy to register and access to and can therefore be very attractive compared to Finnish higher education.

Round 2: Desirability average: 3.63, probability average: 3

Round 3: Desirability average: 3.53, probability average: 2.94

Arguments regarding previous claim:

- Simply the lower price drives us to this.
- MOOCs are not yet established providers. In the future, however, they might be.
- Ease of access is everything. What does the quality of material matter, if one gets lost in trying to access.
- Good idea but can we afford that?
- I see this as one of the main social responsibilities of the universities in Finland.
- While the necessity of a degree is diminishing, the need for continuous education is rising. Therefore it should be made as easy as possible to further ones education. However, the political landscape is far too different for this scenario.
- I feel MOOCs work best on continuous education, where motivation is present and learners know how to learn.
- Being a "osaamisyhteiskunta" continuous learning should be more like a custom than an exception. The world is changing, and new skills are needed constantly. For adults/graduated, that are already working full-time and supporting family, ease of attending courses when suitable is crucial for them (place and time independent)
- The pressure to constantly develop one's expertise is growing, meaning that the education system needs to match the growing demand for flexible learning methods.

17. The Finnish higher education institutions need to provide education in smaller products than courses.

Courses are mostly comprised of several learning goals. Teaching should be provided in smaller packages than current courses in order to provide more freedom of choice in the contents of a degree. This would require more guidance for selection of studies but would produce degrees better fit for the present day and for the future.

Round 2: Desirability average: 3.38, probability average: 2.81

Round 3: Desirability average: 3.18, probability average: 2.65

Arguments regarding previous claim:

- Two bladed sword. Makes a lot of work but would benefit in different education packages.
- Coordination problems, and inefficiencies prevent this to happen. Would require far more effective study councelling.
- The more we fragment our product portfolio, the more micro-management and administering is required.
- Rigid administration makes this difficult, but it should be addressed as this is for the benefit of the students' learning.
- Tampere3 plans to increase the size of courses
- Even courses tend to be too fragmented. Going to a university should not be about basic skills training. For some purposes, smaller packages might work, but there is a risk of losing the big picture of the studies and socialization to a professional or academic field.
- With the current courses, learning goals and credits for a degree coming from the legislation, I'm second-guessing how probable this is. But this is highly desirable like I said in the interview: new

atomic "courses" could offer highly personalized degrees.
- Seems to me I misunderstood the question on the previous round. However, smaller units make is easier to build different kind of programmes, especially on continuous education. On the other hand, they cause a lot of "course administration" and makes it harder to make schedules.
- Degrees need to be somewhat consistent and comparable. Smaller packages are needed in further education.

18. The Finnish higher education institutions need to provide education in smaller products than courses especially for open and continuous/further education.

It seems to be more and more usual that the need for continuous/further education is only a specific fragment of a whole course. It would be a better service experience if the continuous/further education student would have an easy access to the specific need only.

Round 2: Desirability average: 3.19, probability average: 3

Round 3: Desirability average: 3.12, probability average: 3

Arguments regarding previous claim:
- Might work here.
- If we manage to build modular programmes, of which we can pick suitable parts, without making the organizing, administering etc. too heavy on ourselves.
- Very much needed, but again, rigid administration (in degree studies) makes this difficult.
- See above.
- With the current courses, learning goals and credits for a degree coming from the legislation, I'm second-guessing how probable this is. But this is highly desirable like I said in the interview: new atomic "courses" could offer highly personalized degrees.
- That's true (see previous answer). Courses might be smaller (2 sp?), but they should be somewhat consistent with content (the student probably cannot pick just some fragment). This claim fits with the idea of continuous education.
- The pressure to constantly develop one's expertise is growing, meaning that the education system needs to match the growing demand for flexible learning methods.

19. Digital student platforms should also display the development of students' skills, competences and knowledge instead of focusing only on secondary information regarding learning such as study credits and grades.

The curriculums have developed to a more competence-based model but students have no digital services available to inform of the cumulative competences gained. The digital platform of Tampere3 should provide a competence portfolio for students. only.

Round 2: Desirability average: 3.63, probability average: 3.13

Round 3: Desirability average: 3.65, probability average: 3.12

Arguments regarding previous claim:
- Difficult to response, so many viewpoints in the same question.
- How do we measure that?
- Mechanistic measurement of "learning" through credits and grades reigns supreme, and unfortunately the global trends support it.
- An all new information system is sadly not going to happen in the near future with the more critical systems still being build.
- This might include the idea of gamification, which is thought to be a motivating approach for some

students. Digital badges per course should be considered (which a student could choose to publish as part of cv)

20. In addition to communicating the skills, competences and knowledge gained in education, the digital platforms for students should be harnessed to student guidance.

The digital platform should inform students of different possible pathways when choosing the contents of the degree. The platform should provide data on what competences students would gain, where have graduates with similar competence profiled have worked, what the employment rates of the graduates have been etc.

Round 2: Desirability average: 3.63, probability average: 3.06

Round 3: Desirability average: 3.65, probability average: 3.06

Arguments regarding previous claim:

- An all new information system is sadly not going to happen in the near future with the more critical systems still being build
- More modular the school system becomes, the more aid the students need on a normal day's work.
- Competences should be classified to be able to compare them
- In my opinion, this use of technologies is far more important than just communicating the skills, competences and knowledge. Existing communication platforms (even Facebook) can, and in many instances are used in this.
- The key word here is "student guidance", not "focus on employment".
- Sounds somewhat nice for student, but at the same time very complex to fulfill. Employment rates vary very much as the society around changes, and one should not blindly look at those figures.
- I agree with the point about better guidance but I do not think that there should be a very strong focus on employment.

21. Tampere3 should utilize external education such as MOOCs as widely as possible and focus the use of its own resources on maximizing students' learning in contact teaching.

There are a lot of MOOC providers especially for basic/introductory level courses. Focusing on student learning instead of teaching would improve the efficiency of education.

Round 2: Desirability average: 3.07, probability average: 2.88

Round 3: Desirability average: 3.06, probability average: 2.82

Arguments regarding previous claim:

- Why try to make basic/introductory courses ourselves, when someone has already made better teaching material? An idea to focus solely on contact teaching is great, but it's a bit too big a step from the current way of doing things for it to actually happen.
- MOOCs may hold tons of good quality materials alone (videos, articles etc.), and these could be exploited in making the education more cost effective, rather than making the students to go through a whole MOOC course. And English language skills should not be that big of an issue for anyone who studies, or works, in a HEI.
- So basically what the arguments are saying is that "Tampere3 identity" is more important than using the best tools and teaching available? The claim states that MOOCs will be used as widely as pos-

sible and the resources saved are used in contact teaching? How can someone be against this? Tampere3 identity is formed in the mass lectures where 500 students are trying to focus on some researcher-made-teacher giving a lecture on vectors? Right...

- Even basic courses have different kinds of variations, emphasis on different things, etc. This may work on some subject, but not in general.
- *If* there are MOOCs that promote the basic skills needed for more advanced courses, it might be cost-saving. But at the same time it should be considered what and how the "Tampere3 identity" means and is achieved. Does the university want, that the students feel that they are - or were once graduated - Tampere3 students, and that was something special compared to any other "join the standard MOOC" university.
- MOOCs should be used more. However, I have cautions about replacing teaching with MOOCs especially in terms of introductory courses.

  The main issue with MOOCs is that they are mainly in English. Most students do not enter university with the language skills necessary to study mostly in English. The issue is the gap between the level of language education in secondary schools and the demands of universities. The situation would obviously be different if more MOOCs were made in Finnish.

22. Finnish higher education institutions should create a network/forum on utilization of educational technology to promote and advance the utilization rate of technology on education.

Networks and forums are a good way of sharing best practices between organizations and to build new forms of collaboration between institutions.

Round 2: Desirability average: 3.31, probability average: 2.88

Round 3: Desirability average: 3.35, probability average: 2.82

Arguments regarding previous claim:

- Best practices are extremely difficult to share so that they make a difference. That is the reason for my low probability rating.
- There is no point in competition between Finnish institutions of higher education, instead we should use all the resources we have for common good.
- I don't see any downsides to this.
- My somewhat negative desirability answer is caused by the notion, that using technology is not a goal by itself, the goal should be something that is achieved by using technology. Better learning? Less costs?

  But sharing practices and information is extremely important in a small country like Finland.

Are there any claims highly relevant to the development of digital campus that you would like to add regarding teaching and learning?

- It is all about structuring a new type of university. Unfortunately in Finland the structure of our educational system is preventing change.
  Finland is an open market for global competition and the hands of Finns have been tied and they cannot participate in global competition.
  Focus on limiting structures is needed.

Theme 2: Organizational structures and development supporting digitalization

23. The digital campus of Tampere3 should promote cross-disciplinary cooperation.

Just as the physical campuses of Tampere3, the digital campus should encourage the academic staff and students for cross-disciplinary cooperation.

Round 2: Desirability average: 3.69, probability average: 3

Round 3: Desirability average: 3.65, probability average: 3

Arguments regarding previous claim:

- Cooperation with the whole ecosystem; businesses, organizations, HE departments, students etc.
- Vital for students' success in the real world.
- There are some cultural barriers. Communicating respect for and trust in the work done in another discipline is more challenging online than in face-to-face contact.
- This is a way of working - not suitable for each and everyone, but I cannot see any reason why it should not be encouraged. It does not prevent doing inter-disciplinary research when needed.

24. In the digital campus of Tampere3, organizational boundaries such as faculties should not be visible unless the information is truly relevant.

For example, a student looking for interesting courses or guidance in studies most likely is not interested in organizational structures when looking for information.

Round 2: Desirability average: 3, probability average: 2.06

Round 3: Desirability average: 3, probability average: 2.06

Arguments regarding previous claim:

- In cases where information is tightly context specific (i.e. related to a specific operations or units), structuring based on organizational structures is justifiable, and even helps the user to find the information. But, for example in regard to the accessibility of course supply information, boundaries are not that relevant. Nevertheless, some clear taxonomies of information are needed.
- Admin boundaries are irrelevant for the student and the staff. Meaningful community boundaries are necessary (to create cohesion).
- When material practices and division of resources is based on institutional boundaries, it is nearly impossible to overcome these boundaries anywhere. Also, different disciplines with different knowledge practices may have different organizational needs.
- Organizational structures still matter when deciding who writes the information available.
- Resources are going through faculties. Hence, the boundary is seen even if not wanted.
- My view with this is a bit mixed. Especially a young student needs a social group which they feel as their own, something they belong to. Feeling lonely or detached are real problems already now, so one should be very careful with how to build a studying environment where also social well-being is thought and promoted.

  Neither do I see any reason to hide the faculty or institute behind a course as it might be an interesting information for those still thinking what to pick into the course schedule.

  It should be looked after that there are as few barriers as possible when a student wants to study something that is not in their normal course plan.

25. The role of IT support should be more facilitative than controlling.

Instead of strict control of what staff and students are allowed to do, they should have as much freedom as

possible without compromising information and data security.

Round 2: Desirability average: 3.75, probability average: 2.44

Round 3: Desirability average: 3.76, probability average: 2.41

Arguments regarding previous claim:

- We definitely need more emphasis and resources for fast, explorative and innovative ICT-development. And naturally laws must be appreciated. We definitely need more safe-fail mentality than fail-safe though.
- IT admin tend to be too scared of laws and privacy regulations. Saps!
- The role of It should be integrated into the management of universities. Online providers like Coursera are using IT strategically. Finnish universities receive their operational it systems from an outside provider. There is no strategic need or guidance from the management.
- You must obey laws and privacy
- It's interesting to see that in my line of work dealing with financial institutions and their information systems, I have more freedom on when it comes to devices, programs and pretty much everything, than I have on campus.
- Desirability is higher than probability as IT is slow to change. One point should be thought though - cost controlling. Someone must look after costs and see, when freedom is too costly and in what services standardizing is needed, and when not.

26. Staff and students should have a complete freedom to use the best digital applications and services they see fit. Therefore the IT support is not expected to provide support for all digital applications and services used in teaching and research.

The role of IT support will transit to providing support to the development of staff and students in autonomous use of digital equipment, applications and services as well as helping staff and students sharing their best practices to the rest of the community.

Round 2: Desirability average: 3.31, probability average: 2.56

Round 3: Desirability average: 3.29, probability average: 2.53

Arguments regarding previous claim:

- There is a trade off somewhere
- Money is the limit. You can nowhere in the society have all you want. There are always economical limits. Even use of open source products is limited in business use f.ex.. Adobe Acrobat reader
- There is virtually no way for the IT support to control which applications and services are used, nor do they have resources to support all of them. They should focus on the core service and application package that enables effective teaching and learning, and outside that, let people choose as freely as possible and even encourage that.
- Security issues makes this hard.
- I'd like to repeat the previous comment (25) regarding cost controlling.

  I'd say, that it should be decided and expressed, in what areas the complete freedom is suggested and in which not. Administrative systems are probably a must, not a choice. Any processes that have a legal aspect like need of auditing or logging, are not under "complete freedom". Also ownership of information is an important factor: in some services the service provider holds even the copyright, and that's not acceptable in most cases.

  In the other hand in cases where the nature of data or process do not put a hindrance, freedom should

be promoted. Some platforms or applications should be suggested for those not being able to choose themselves.

27. Tampere3 should provide a platform and resources for peer support in development of teaching.

A good example of this is the Digimentorit (digitalization mentors) network in TAMK, in which the teachers familiar with digitalized solutions in teaching provide support to teachers that are less skilled in utilization of technology.

Round 2: Desirability average: 3.69, probability average: 2.88

Round 3: Desirability average: 3.71, probability average: 2.82

Arguments regarding previous claim:

- Resources are the key here, alongside with recruiting the right individuals.
- Must-have, and will be there in a few years' time. E.g. a Yammer group (or something similar).
- Again, institutional boundaries may be a challenge here.
- With "everybody teaching and researching", who has the time?
- As there already is a good example of this, why not try it in broader environment. Many large organizations have been successful with crowd-sourcing the support work. In Tampere3 it should be investigated whether the same idea of platform/peer support (crowd-sourcing) could be extended to other groups as well.

28. Co-creation is an important mindset in Tampere3 with for example students being a critical resource in the development education and services in Tampere3.

Students should be harnessed in the development of education and services as a part of formal studies or as employees of Tampere3.

Round 2: Desirability average: 3.27, probability average: 2.88

Round 3: Desirability average: 3.25, probability average: 2.82

Arguments regarding previous claim:

- We definitely need to move on from the students´-voice to students-as-co-developers practices and culture.
- Students are able to take part in developing education and services based on their own experience. The faculty members should respect that more than they perhaps do, and offer their support where needed. Saying that students are unable to take part only tells something about the effectiveness of teaching. Developing capacity for active participation is not optional in higher education, but in the core of its purpose.
- Students are cheaper than official employees, therefore they will be used.
- May need more work by the faculty members than doing oneself.

29. Higher education institutions need to transfer from the mindset of offering products to mindset of offering services.

Higher education institutions will transform into platforms on which enterprises can build their business on and utilize the infrastructure and knowledge capital located on the campus area.

Round 2: Desirability average: 3.44, probability average: 2.94

Round 3: Desirability average: 3.53, probability average: 3.06

Arguments regarding previous claim:

- Actually the current methods of service development/design very much embrace the customer involvement and collaboration, instead of assuming the customer as a passive consumer. The whole idea of shared ecosystems is about collaboration as equals, despite of the role in the value chain. Whether we like it or not, many of the design frameworks for such as online course development build on the very basic principles of design thinking, in which the user/customer is at the very core.

  However, I´m not saying the students should be named as customers, I´m just appreciating (and assuming) that customer-centric mindset is actually beneficial in any development, including pedagogy.
- Apparently many of the respondents interpreted this differently. I interpreted HEI admin "need to transfer from the mindset of offering products to mindset of offering services". Teachers or researchers do not provide products nor services to the students.
- This is highly irrelevant. We should offer neither but focus on fostering development of our students, science and civilization. Both services and products assume a passive consumer as their "recipient", even if "services" sounds marginally more active.
- There is a far too large a gap between the current situation and this scenario.
- The main tasks for a higher education institute are teaching and research, not being a passive platform. (Maybe I just do not get the idea behind this claim)

30. Digitalization should be a comprehensive theme in all planning processes of Tampere3.

Digitalization affects all actions and services of Tampere3. It needs to be one of the strategic goals of Tampere3 to ensure it will be thoroughly planned and implemented.

Round 2: Desirability average: 3.81, probability average: 2.88

Round 3: Desirability average: 3.65, probability average: 2.94

Arguments regarding previous claim:

- Digitalization is not a tool, digitization is. Digitalization is a thorough megatrend, a phenomenon, which needs to be taken seriously into consideration in the overall management and strategic development of Tampere3.
- Yes, you would need a crystal clear definition for digitalization before you can anchor everything on that.
- It's crucial to define what is meant by digitalization and the desired effect on collaboration and student experience. Technology has a role with regards to experience that goes beyond "using it" as "a tool". For instance, digital technology already mediates much of our everyday experience and is an always-present background context to our "non-digital" experience as well. Even if one decides to "opt out" of digitalization, the choice is meaningful only against the background of already omnipresent digital technologies. Like it or not, digitalization is already a central theme and cannot be made less so. More than anything, it should be understood and digital tools employed in a meaningful way.
- Digitalization is a tool for gaining something, not a goal as itself. Extremely important is to define - and to set a goal - what a digitized Tampere3 university is.

  The goals in Tampere3 could probably something like virtual campus and chance to significant cooperation without need to be physically in the same place; and in the other hand effective service processes .

  Once the real goals are set, the work with making it possible with digital tools starts. It needs to be

planned well-enough and implemented. The technical architecture and components need to be defined. The processes, information architecture and modularity needs to be planned.

The implementation work needs to be done in small steps to avoid too expensive errors. Errors are bound to happen, so better make them small.

Are there any claims highly relevant to the development of digital campus that you would like to add regarding organizational development and structures supporting digitalization?

- Digital campus development and implementation requires certain level of re-inventing the existing ways of delivering value. Thus it is essential that it will be approach not merely as a digitization project, but rather as a strategic innovation and exploration project, which involves various different domains of the consortium. With the aim of establishing a new "digital business" model alongside the traditional model.
- What needs to be understood from the gecko is that digital services are never finished. They require constant upgrades, new functionalities and fixes. User expectations are racing forward all the time and if Tampere3 wants to be the best, it can never be satisfied with the service level it someday will achieve.

Theme 3: Financial issues regarding digitalization

31. Digitalization of higher education will result to financial savings in administration of higher education institutions but not in education, research or societal impact.

Digitalization will result to improvement of quality in education, research and societal impact, but not financial savings.

Round 2: Desirability average: 3.2, probability average: 2.8

Round 3: Desirability average: 3.31, probability average: 2.88

Arguments regarding previous claim:

- DIGITIZATION of higher education institution´s administration will result financial savings, undoubtedly. Digitization of education and research, and related practices (e.g. collaboration, shared content, co-writing etc.) can improve efficiency. Digitized means will also improve the efficiency of dissemination of innovations and new knowledge, and thus result savings from the societal impacts point of view.
- Confusing question - cost of admin are a part of costs of education research and societal impact!
- Eventually, perhaps. Not holding my breath either.
- Confusing question. In bold is said "will result to financial savings", below "not financial savings". I do not believe in financial savings, even in administration.
- I would not hold my breath when waiting for the savings in administration...

  It might also improve the quality of administrative services.

32. Savings regarding digitalization of administration require the digitalization of the whole process.

Digitalizing only parts of a process tends to result to equal amount of human work necessary.

Round 2: Desirability average: 3.25, probability average: 2.75

Round 3: Desirability average: 3.53, probability average: 2.59

Arguments regarding previous claim:

- People cling onto their habits in order to stay safe. Clear leadership needed here.
- Business process re-engineering. Digitalization is not enough, the processes need to be re-engineered.
- The process should be restructured, not only digitized, to gain real benefits. I've seen service processes in which every step is fully digital, but the whole process is so complicated and slow, that it makes everybody unhappy.

33. Instead of following the framework of funding set by Ministry of Education, Tampere3 should create its own indicators to promote developing collaboration with stakeholders such as businesses and national and international higher education institutions.

There are no financial incentives for some important developments that should be accounted for in order to compete in a global environment, such as transferring courses available for online studies globally and encouraging utilization of external online study materials.

Round 2: Desirability average: 3.5, probability average: 2.69

Round 3: Desirability average: 3.53, probability average: 2.65

Arguments regarding previous claim:

- As long as there won't be too many conflicting incentives with the national funding model.
- Indicators AND incentives.
- Own metrics are excellent idea, but they should be aligned with OKM metrics.
- Yes, this is great. It shows that also the university is thinking and setting goals and not only the Ministry
- Currently, financing education is not possible if ministry's framework is not followed.
- Of course Tampere3 needs its own metrics to track if strategic goals are met - like "sitä saa mitä mittaa".

  I doubt though that Tampere3 would be able to forget the funding framework, so it needs to be followed as well.
- Searching additional funding and independent, creative tracks of development should be encouraged. However, I still see the ministry of education as the most significant source of funds and national educational guidelines, meaning that its indicators should not be replaced but rather supplemented.

Theme 4: Stakeholder collaboration

35. The digital campus of Tampere3 should provide a gateway to create and maintain collaboration with international stakeholders.

Just as all students globally should have an easy and quick registration to online education provided by Tampere3, international businesses and higher education institutions should have quick and easy ways of cooperation with Tampere3.

Round 2: Desirability average: 3.5, probability average: 2.88

Round 3: Desirability average: 3.47, probability average: 2.88

Arguments regarding previous claim:

- With all the stakeholders.
- Open research data is an interesting note here.
- Again, Tampere3 should first define what it wants to gain with "quick and easy ways". Quickness usually means, that there is someone with nothing to do so that he/she can jump into any cooperation work. Research groups have planned their work and projects often for years to come, so new cooperation initiatives may take some time. So maybe the word "quick" could be dropped.

  Open research data is probably the easiest (not labour-intensive) way of providing cooperation.
- Being able to begin collaboration quickly and without hindrances is definitely something that is desirable. Being clear about strategic goals of this kind of collaboration would help. "Anything goes" is neither quick nor easy. Students can also be engaged in labour-intensive (short-term) collaboration, as long as the benefits for the learning process are clear.

36. The digital platform of Tampere3 should support everyone located on the campus, not just the academic community but also the businesses and other stakeholders located on the campus area.

Tampere3 needs to enhance collaboration with external stakeholders to increase its societal impact. It is important to have sufficient digital services available also for external stakeholders.

Round 2: Desirability average: 3.31, probability average: 2.63

Round 3: Desirability average: 3.29, probability average: 2.59

Arguments regarding previous claim:

- The term "Digital platform" is slightly vague. Is it open wifi or something more ambitious? I do not see the benefit for univ. IT admin to serve startups on campus. (It should be a super great IT admin like never seen before!)
- Licencing for universities is very different than for companies. Depends on the contents of the digital platform.
- What is meant by "digital platform" here? Cooperation platform like sharepoint or wiki?

37. The resources of higher education institutions, such as library, should be more accessible to stakeholders.

Tampere3 would be a much more attractive collaboration partner to businesses if resources such as the library would be more accessible for them. The resources could also include the human resources of Tampere3, both in the forms of staff and students.

Round 2: Desirability average: 3.31, probability average: 2.56

Round 3: Desirability average: 3.29, probability average: 2.59

Arguments regarding previous claim:

- Yeah, it should be, but cannot be, as long as there isn't enough sense in IPR issues (for the digital world). That battle can take time, even if Elsevier et al. are fighting a losing battle.
- Digital rights and their costs limit possibilities
- So what prohibits library from selling its services?
- Some has to pay this kind of things. Library costs, staff etc. are not free, so what means "more accessible"?
- Isn't the library already accessible? Online material (digital articles etc.) could be offered if someone

had the money. Cost-effectiveness?

- Library is already accessible on premises. Being able to offer access to digital resources for outside stakeholders (not staff or students) would require totally new kinds of licensing schemes for online resources, and these would probably have to be negotiated on a national level. Limited access to information specialists and unlimited access to open access resources produced in Tampere3 should be provided for anyone registered as a library user. This is part of the public service mission of the university.

38. Finnish higher education institutions should know what kind of enterprises and businesses operate in their surroundings and actively keep in touch with them.

Especially small companies might not have the resources to look for collaboration partners within a higher education institution. It would greatly ease creating new collaborations if the higher education institution would make contact to the businesses.

Round 2: Desirability average: 3.69, probability average: 2.88

Round 3: Desirability average: 3.65, probability average: 2.88

Arguments regarding previous claim:

- One way of improving this awareness is through collaboration, and investing on this. Of course some available data can also be utilized to increase the knowledge in this area. I don´t see this as a project of setting up meetings with thousands of businesses, to get deep insight on who they are.
- Could be beneficial, but won't happen unless there are some structural incentives.
- And once again the arguments say that this can only be achieved through people... Giosg or Vainu.io or other similar services are out there.
- How many small companies are in TAmpere3 area? Thousands? This would need high headcount of people just contacting companies...
  The comment regarding students and staff to look for collaboration sounds good.
- It has to be defined what this "actively keeping in touch" means for Tampere3.
- I would prefer an option where students and staff would be encouraged to look for collaboration rather than the institution spending funds on such a project.

39. Tampere3 should build a competence register of the skills and competences of its staff and students to ease finding solvers to any problems stakeholders might contact Tampere3 with.

The staff and students of Tampere3 combined have skills, competences and knowledge for a very broad range of subjects. In order for businesses to be able to purchase services for a certain need, the higher education institution should have a register categorizing the competences of its staff and students.

Round 2: Desirability average: 3.38, probability average: 2.5

Round 3: Desirability average: 3.47, probability average: 2.59

Arguments regarding previous claim:

- That must be voluntary
- Individuals have rights to decide what to show for stakeholders.
- Nice idea, but hard to gain. Should someone control, what competencies one can add - like would everyone be able to tell that they're rocket scientists?
- Good idea in theory. In practice, utilizing this kind of a database effectively requires strategic HR planning and commitment and goal-sharing from different levels of organization. If not utilized

effectively for f.ex. academic career development, this kind of a register quickly becomes a frustrating exercise for everyone involved. "Marketing" specialists to businesses sounds like university becoming a consulting company? Is this part of its mission? If I had ambitions for becoming a consultant (or continuing as one), do you think I would be working in a university? ;)

Theme 5: Societal impact

40. Instead of viewing continuous/further education as a source of income from alumni of Tampere3, it should be viewed as a way of committing alumni to Tampere3.

Tampere3 could prove to be very attractive higher education institution if it could promise its alumni free continuous/further education for life. By committing alumni to Tampere3, new business models would emerge

Round 2: Desirability average: 3.06, probability average: 2.31

Round 3: Desirability average: 3.18, probability average: 2.41

Arguments regarding previous claim:

- It should be important source of revenue. If we offer good education, they will be ready for pay for it.
- Fully agree with this one "It should be important source of revenue. If we offer good education, they will be ready for pay for it.". There is so much free education already. In commercialized education, the businesses and other organizations pay the bills in many cases, not the individuals.
- Mixed feelings. Paid education is good for study commitment, but committing alumni is in any case needed
- Free - someone has to pay it anyway. Currently I see this nearly impossible in large scale.
- I'd rather suggest a small (reduced) fee for alumni, as some kind of cost makes people more keen on finishing the course that they've started.
- Having committed alumni is good marketing. Having some kind of cost for participants is a good idea, as it increases the commitment on a course and its outcomes, and strips the illusion of continuing studies as a "free hobby".

41. Tampere3 should guarantee all its alumni a lifetime access to at least the research conducted in Tampere3 and preferably to wider amount of information.

Tampere3 could prove to be a very attractive higher education institution if it could promise its alumni a lifetime access to information produced in Tampere3. By committing alumni to Tampere3, new business models would emerge.

Round 2: Desirability average: 3.38, probability average: 2.44

Round 3: Desirability average: 3.47, probability average: 2.59

Arguments regarding previous claim:

- All the research should be open access.
- Research results should be available for everybody. I can't see business model for the university.
- I'm not sure whether I understand this correctly. I suppose this means something like that an alum is allowed to get a copy of any article or research paper done by Tampere3 researchers.
- ALL research done in the university should ultimately be made freely available and accessible for everyone. Perhaps an alumni newsletter highlighting interesting research and development work in their own area would be good.

- The claim depends on whether successful alternative business models could be developed or not.

42. Tampere3 should take more responsibility from its unemployed alumni by offering a platform for networking and collaboration with the Tampere3 staff and students and the businesses operating in the campus area.

It is in the interests of Tampere3 to have its alumni employed and it is in the interests of the unemployed alumni and businesses operating in the campus area to meet each other.

Round 2: Desirability average: 3.06, probability average: 2.44

Round 3: Desirability average: 3.06, probability average: 2.41

Arguments regarding previous claim:

- I would add businesses and organizations that collaborate with Tampere3, and not limit the scale to cover only the business within the campus area.
- No need. LinkedIn etc. make this 100x more effectively.
- Sounds very resource-intensive.

43. Tampere3 should take more responsibility from the unemployed refugees with an academic background in Finland by offering a platform for networking and collaboration with the Tampere3 staff and students and the businesses operating in the campus area.

The amount of refugees, also the ones with academic background, has greatly increased in a short time. It would benefit all parties to commit them to Tampere3.

Round 2: Desirability average: 3, probability average: 2.19

Round 3: Desirability average: 3.06, probability average: 2.24

Arguments regarding previous claim:

- Check the previous argument.
- I'd suggest that open university courses and "täydentävä opetus" are needed to ensure that the academic background is valid for the Finnish market.

Theme 6: Academic community

44. Students should not be thought of as consumers or customers but instead as equal members of a higher education institution community.

Students should be integrated to the higher education institution as a member of the community. Higher education should be free of charge in order to avoid the customer mindset for students and provider mindset for teachers.

Round 2: Desirability average: 3.44, probability average: 2.63

Round 3: Desirability average: 3.53, probability average: 2.59

Arguments regarding previous claim:

- Customers, consumers, which ever. The point is that a customer, a consumer, or a student - which ever term we use - are all equals with the community, if we aim for the collaborative and co-creative ecosystem and high quality services.
- Should be, but won't be. Because tradition and power hierarchies.
- Good idea, but students have also right to ask services and university should understand meaning

of service production

- I once heard a rumor - wrong, I wish - that an open university servant had commented to a university professor, that he cannot fail so many students in an exam as those students are paying customers. I hope this is not the picture of the future.

  But anyway I would not stop thinking students *also* as customers in addition to that they are members of the community.
- Absolutely. Positing students as recipients or consumers of "educational" services only drives the general passivisation of the society. Having said this, some parts of the university must be focused on providing "student services", and for them, students should perhaps be seen as customers.
- The academic community suffers as a whole if a part of it are considered customers. International studies have also shown that such a mindset decreases the quality of learning.

45. By 2030 the higher education institutions will develop to appreciate professionalism higher than in the present day, which will for example lead to separation of teachers and researchers in higher education staff and emphasizing leadership skills of academic leaders.

Round 2: Desirability average: 3.25, probability average: 2.94

Round 3: Desirability average: 3.41, probability average: 3.06

Arguments regarding previous claim:

- Agree, teaching must base on research and newest knowledge. However, learning must also base on applying the knowledge produced by the research community. And we should definitely embrace rigor information sources as learning materials.
- This is happening to some extent already. Complete separation is not the aim, but increasing value of good teaching.
- Teaching in universities must based on research
- I oppose large-scale separation of teachers and researchers. For some individuals this should be possible, though.
- Universities will need both specialists and generalists. In some instances separating between teachers and researchers is a very good idea, in some others, not so. I agree that teaching in universities must always be based on current and relevant research and inquiry.

Are there any claims highly relevant to the development of digital campus that you would like to add regarding academic community?

- Leading a digital campus is a job for a professional, it is a well led machine in which academics should feel comfortable (what a challenge!)

Theme 7: Openness and accessibility

46. Openness, availability and accessibility of data should be at the core of data policy in Tampere3.

Openness of data is a strong trend in higher education. Availability and accessibility are important aspects in open data to ensure its usability.

Round 2: Desirability average: 3.88, probability average: 2.93

Round 3: Desirability average: 3.94, probability average: 2.94

Arguments regarding previous claim:

- Absolutely. The sheer potential of open university data provides for HE-development itself, by the students for the students as well.
- Elsevier et al are doomed, sooner or later.
- http://www.tiede.fi/blogit/kaiken_takana_on_loinen/tutkimusraha_valuu_julkaisijajattien_taskuihin
- As this has been a strategic goal in national level, it will probably happen also in the university level.
- Absolutely. Open access is gaining ground, and rightly so.

47. University campuses should be more open to everyone, not just members of the academic community and key stakeholders.

Higher education institutions are publicly funded and should be more attractive and accessible to all citizens. This would also improve the utilization rate of physical infrastructure

Round 2: Desirability average: 3.13, probability average: 2.4

Round 3: Desirability average: 3.12, probability average: 2.29

Arguments regarding previous claim:

- It could be that parts of the campus are more like public libraries but it is not very desirable, as there is no meaningful benefits.
- Hard question especially when physical infrastructure is often just good enough for the academic community. Who would decide who's the first in line to use some scarce resource?
- Anyone interested enough to visit campuses and take part in university activities should be encouraged to do so. Most of the lectures are already open for anyone interested, but I don't think this kind of interest is too widespread in our society.

48. All digital systems of Tampere3 should be developed as open source software to promote openness and transparency.

Open source software would also allow for the members of the community to partake in development of digital systems

Round 2: Desirability average: 3.31, probability average: 2.38

Round 3: Desirability average: 3.24, probability average: 2.35

Arguments regarding previous claim:

- There is no obstacles to require OSS for all software development. There are plenty of excellent providers that have no objections.
- This is possible only in research. Other ways it is only theory but impossible in practice. Should we f.ex. build our own word processing programs?
- I understand this to mean that the systems of T3 are based on open source software, not that we should to everything ourselves.
- "All" is the word why I chose 2 instead of 3. Pragmatic approach is needed, and Tampere3 should not use it resources to develop something that is widely available in commercial software (like HR system).

  But once Tampere3 develops something in its own, it should be open and available.

Are there any claims highly relevant to the development of digital campus that you would like to add regarding openness and accessibility?

- Openness of software code is just one approach. More useful - and important - aspect is openness and offering of the API's to approach both public and private data ("my data"). Proper API offering causes savings in the long run (and helps to avoid vendor lock-in), and also offer tools for eager developers. "API first" approach has been used in some cases, and is probably the trending hot topic in the near future. (see like apimanifesti.fi)

Theme 8: Physical campus

49. The physical campus should support the utilization of digital services and content on and off campus.

Even with extensive digital services providing freedom of time and location, the members of Tampere3 community should find the campus area attractive enough to choose to utilize the digital services on the campus if possible.

Round 2: Desirability average: 3.81, probability average: 3.25

Round 3: Desirability average: 3.82, probability average: 3.24

Arguments regarding previous claim:

- The Digital should go together with the physical. This interplay is core to success
- Why offer digital services only on campus?
- No point in digital services that only work on campus.

50. Staff and students of Tampere3 should have an around the clock access to both digital and physical campuses.

Studying, research and other interaction in the physical campus should not be limited to normal office hours

Round 2: Desirability average: 3.63, probability average: 2.88

Round 3: Desirability average: 3.59, probability average: 2.82

Arguments regarding previous claim:

- Maybe on some facilities, but not all.
- I think the physical needs to sleep?
- Some restrictions on physical access are needed.
- At least the libraries and group workspaces should be accessible (almost) round the clock. In other parts of the world (UK, US, Australia), this is already a norm.

51. Stakeholders of Tampere3 such as businesses should have an around the clock access to both digital and physical campuses.

Tampere3 would be a much more attractive collaboration partner for businesses and other stakeholders if they could interact with the community outside of normal office hours.

Round 2: Desirability average: 3.25, probability average: 2.63

Round 3: Desirability average: 3.18, probability average: 2.59

Arguments regarding previous claim:

- no need.
- I don't see the need for physical access. Staff can invite them whenever needed.

- Needs more definition before I could answer. Of course digital campus is open round the clock, but if this claim means that it would be guaranteed that someone will answer any time of day to any question, the cost-effectiveness is probably low.

52. The digital campus should support remote access to laboratories of Tampere3 to boost the utilization rate of infrastructure.

The remote access to laboratories should be available to external stakeholders such as other higher education institutions for a compensation. The utilization rate of laboratories is currently very low in higher education institutions.

Round 2: Desirability average: 3.5, probability average: 2.56

Round 3: Desirability average: 3.59, probability average: 2.65

Arguments regarding previous claim:

- If that access is feasible and easily arranged.
- Some laboratories need physical access, and also in those cases the utilization rate could be increased by opening them to stakeholders.

Theme 9: Structural development of higher education institutions

53. Higher education institutions should transit from closed, local institutions to open, global institutions.

So far Finnish higher education institutions have positioned themselves mostly on a national scale and are quite closed in accepting applicants to higher education. In the digital age especially with the possibilities of internet, services are global and open. The Finnish higher education institutions should reposition themselves as global and open.

Round 2: Desirability average: 3.75, probability average: 2.56

Round 3: Desirability average: 3.82, probability average: 2.65

Arguments regarding previous claim:

- Competition in HE is global already. T3 should not drop the ball at this stage. I'm afraid it will.
- Resources are not adequate at all
- As I understand "global institution" this is not possible. Perhaps I don't understand the question correctly.
  Anyway, I disagree with being "closed" institutions.
- The strategy regarding "being global" needs to be defined. Looking for growth (more students every year)? Keeping the current size? Specialising? Doing the same as everyone else? Income from foreign students (tuition fees should be bigger than the building costs of the service)
- Being local is fine, being closed not so. Truly global reach requires resources that we currently do not have. Perhaps possible in some narrow senses.

54. Finnish higher education institutions develop too slowly compared to private sector because of steady public funding which removes the necessity to fear for one’s job.

The private sector needs consumers to like their products in order to survive. Since there is no fear for survival with steady public funding, the higher education institutions have not made adaptations necessary for operating in the digital era.

Round 2: Desirability average: 2.25, probability average: 3

Round 3: Desirability average: 2.35, probability average: 3.12

Arguments regarding previous claim:

- Lack of leadership, must change. Mass media paints a grim picture, even if the majority of the faculty are actually pro change. Leaders should not back down.
- Those who work with technology oriented companies have learned to fear technology change. Those who work in the classroom have not had to face technology change in the classroom as yet.
- Employees in universities are very conservative and resists any changes. Leaders of the university should be able to make changes. Leadership needed. When employees are in government no real changes are made.
- Higher education develops too slowly, but I'd say it's not of because the lack of fear for one's job. Currently there are no(?) incentives to actually develop the institution. And leadership like many have stated.
- Again, I don't understand if this claim is a goal or what. Since most of personnel has always had short contracts, and hundreds have just had to leave the universities, I find the claim impossible to understand.
- There is significant fear for losing a job also in public sector. I'd say that the current state is close to panic in some universities.

  Is fear really a better tool for change, and not motivating goals?

  Or could it be, that the real hindrance has been lack of energy and lack of bright vision, that would be understandable and worth reaching?
- Fear for own survival never encouraged anyone to have any positive effect on the society. This neoliberal mantra is completely without any basis in reality. I'm not saying any competition is bad, but it should never be about so-called "survival of the fittest".
- Leadership in most Finnish academic institutions has been lacking and old-fashioned. This, however, applies also to several Finnish companies. It seems that the general leadership culture and models for organisational development need to be significantly improved.

55. Finnish higher education institutions should not narrow down their course and study model offerings but instead keep their selection as wide as possible.

The Finnish Ministry of Education has high expectations for the higher education institutions to focus on their strengths and give up on some fields of research and education that are not the strengths of the institution. However, in the digital era the width of supply should be as wide as possible to survive in the global competition.

Round 2: Desirability average: 2.38, probability average: 2.75

Round 3: Desirability average: 2.35, probability average: 2.65

Arguments regarding previous claim:

- This is the Long Tail of education. One should think what one´s strategy is bearing in mind the Long Tail (selling less of more)
- We must concentrate to those areas where we are good/strong and give up those where other universities are better.
- Is it really desirable to keep fields which have only one professor for example?
- There is a possibility that everybody omits the same part of the studies; actually this seems to take place in some areas. New development may need quick adaptation of some technologies, so there

should be as broad offering of courses as possible.
- The "width" should be achieved in national level.
- This is crucial in maintaining the level of knowledge available in Finnish language and quality of research done in our specific context. Narrowing down would be extremely shortsighted.

56. Asymmetry of information regarding higher education institutions will decrease as the amount of information is swiftly growing which will lead to revealing any quality differences between the higher education institutions.

Asymmetry of information equalizes Finnish higher education institutions in the view of the applicant. As the amount of information and its accessibility grows, it is only a matter of time before the quality differences between institutions are revealed

Round 2: Desirability average: 3.69, probability average: 3.31

Round 3: Desirability average: 3.76, probability average: 3.41

Arguments regarding previous claim:
- Too difficult and long question
- The present classroom is seen only by the students in the classroom. In the future courses can be compared and in this respect "asymmetry of information" will decrease
- Numbers and what is behind the needs to be researched and understood. Ranking lists of high schools tell, that high schools with higher initial requirements also produce students with higher marks. Are they of better quality?
- Having the same information available does not mean having the same width or depth of knowledge across institutions. There will always be highly effective and efficient (usually relatively small) research groups and knowledge communities that will lead knowledge production in narrow areas, while others only achieve the minimum expected from them and focus their energies on their individual projects, usually with little contribution to the shared knowledge base of the institution.

57. Finnish higher education institutions should collaborate with primary and secondary education providers in their development. The Finnish education should be developed as a whole.

The development skills and competences in previous educational levels could be better accounted for in development of higher education with collaboration.

Round 2: Desirability average: 3.38, probability average: 2.75

Round 3: Desirability average: 3.41, probability average: 2.76

Arguments regarding previous claim:
- They should focus primarily in their own task
- This is done to some extent, and in general this is OK. But developing as a whole is a different thing and against autonomy of universities.
- Academic Universities should not be seen solely as the final stage of the educational continuum, but institutions that focus on research and inquiry - and educate the researchers to further increase the knowledge base. Universities of Applied Sciences have a similar mission with regards to application of knowledge in specialist professions and developing working life.

Theme 10: Digital systems

58. The autonomy of higher education institutions has led to a fragmented, incompatible set of digital systems. The Ministry of Education should have a stronger role in procurement of digital systems in Finnish higher education.

In order to ensure the compatibility of digital systems between higher education institutions, as many procurements should be done in national collaboration.

Round 2: Desirability average: 2.38, probability average: 2.44

Round 3: Desirability average: 2.29, probability average: 2.41

Arguments regarding previous claim:

- As long as this is done well and effectively.
- Markets have a way of sorting themselves out i.e. platforms standardisations etc. This is a global world. There will be a global shake down of standards and platforms. The ministry should be very very careful in setting and demanding national standards. A very dangerous road.
- As the universities should be autonomous, why should the ministry of education dictate the digital systems? How could they know what are the best solutions for universities problems? Sadly, this is going to happen.
- Only one truth is never a good idea. Some architectural co-operation, yes, but not one-for-all system.
- Depends. Vendor lock-in and extremely large systems are extremely expensive. Compatibility can be achieved also by APIs, data models, integrations etc.
- Any centralised activities in providing digital systems should be planned carefully so that they do not interfere with the forward-looking smaller scale activities on the local level. Centralised creation of systems tends to be expensive and dominated by large international providers with plenty of overhead costs and little motivation.

59. Digital campus should be one of the success factors of Tampere3.

Tampere3 should heavily invest in the development of a digital campus and aim for the most advanced digital services globally to make Tampere3 more attractive in student and staff recruitment

Round 2: Desirability average: 3.75, probability average: 2.88

Round 3: Desirability average: 3.82, probability average: 3

Arguments regarding previous claim:

- Needs to be remembered that not ALL students embrace the digital. There is a group of students that would prefer other kind of teacher involvement.
- One should start with planning services, and add digitalisation after that.
- Digital campus will be one of the success factors, or it will factor in the failure of the whole thing. Digitalisation has been and is ongoing, and universities need to be able to work within its context. Some will likely choose to "opt out", but even this will be done in the context of a digital university. It's not so much about whether digitalisation will be a factor, but what we make of it, and how.

60. Tampere3 should attain all possible digital systems in national collaboration. Attaining digital systems utilized only by Tampere3 should be done only after very through consideration.

The compatibility of digital systems of Finnish higher education institutions is very low due to all institutions purchasing their own software. It would greatly help the collaboration of institutions, for example common courses, if all institutions had compatible systems

Round 2: Desirability average: 3.44, probability average: 2.87

Round 3: Desirability average: 3.41, probability average: 2.82

Arguments regarding previous claim:

- Some systems definitely yes, but with sufficient innovation capabilities we are able to produce technological innovations on our own, that deliver us competitive advantage. Especially systems and solutions that are concerned with digitized learning and teaching and smart learning environments.
- Collaboration would help, but as has been seen with universities collaborating, either it is Helsinki that decides or then the requirements are made with the lowest common denominator. This can't be the case if we want to be the best.
- Compatible, yes, but the same, no. There is never progress, if local improvements or ideas are not allowed.
- Incompatibility is a popular adjective trying to mean something that needs to be avoided. But - what and when it has been a real issue that systems of two different universities are "incompatible" with each other? Could it have been avoided just using similar data models (which is way less expensive than building huge IT systems).

  But of course the claim itself is correct ("all possible digital systems"). One just has to know, when it is possible and when it is sensible.
- Agree with previous remarks.

61. Most of the digital systems are not suitable to be purchased in nation-wide collaboration, since the needs of higher education institutions differ so much that collaboration will not result to economies of scale.

If a system needs to fulfill many differing needs, the development costs exceed the costs that of every institution purchasing its own system.

Round 2: Desirability average: 2.81, probability average: 2.81

Round 3: Desirability average: 2.76, probability average: 2.76

Arguments regarding previous claim:

- Too long question (too many viewpoints)
- There is no real difference
- The needs don't differ that much. It's the level of satisfaction that differ widely. Some universities are satisfied when they at last get a system that generates timetables for students while TUT should never settle for a system like that anymore.
- I'd rather say "many" instead of "most".

  Another problem is that investing cycle might differ, and also the strategic goals (which cause costs).

62. Instead of one big digital system to answer all the needs, higher education institutions should attain a common platform on top of which all the institutions could build the applications they need.

Attaining a common platform on which institutions could build the applications it needs might solve the problems of compatibility and economies of scale in digital system attainment.

Round 2: Desirability average: 3.31, probability average: 2.63

Round 3: Desirability average: 3.41, probability average: 2.65

Arguments regarding previous claim:

- Maybe???
- Platform-approach is the way. This enables us greater flexibility in future development.
- Desirability 4 if this means "Palveluväylä" and other back-end.
- I answer 3 thinking, that platform here does not mean a physical (IT) platform but more like a network of services. API and microarchitecture! Vendor lock-in and lifecycle costs of a massive system ("one platform") are real threats.
- Single platform for teaching would harm the teachers' and students' ability to stay up to date in the development of technologies and likely be too clumsy to support different pedagogical practices. In administration, however, it would be desirable.

63. Tampere3 should not use any of the digital systems used in the merging higher education institutions but attain all new systems instead.

This was the strategy in forming Aalto university and resulted in positive experiences

Round 2: Desirability average: 3, probability average: 2.56

Round 3: Desirability average: 3.12, probability average: 2.53

Arguments regarding previous claim:

- Depending on the quality of new systems
- An interesting strategy. At least they would be in charge of their own IT strategy. Presently nobody knows who is driving the strategic development of IT platforms in universities.
- Which digital systems? Aalto had many different strategies in different cases. Has Aalto really had success??? In general yes but in practice it is no sense to change systems if it is not needed.
- T3 should choose where it makes sense to use something current and where it would be better to choose something new. Categorical "all" will most likely NOT be the best solution.
- None of the current systems are compatible with the other systems so we are ending up with all new systems. Sadly this means that the high service level we are used to in Hervanta is going to drop since it is still something many other universities can't even dream about.
- Some of the current systems have to be good enough for all to use.
- This should be considered at least to some extent. In some cases (systems) starting from scratch is the best approach (like email etc.), but it could be that some systems of some of the universities are modern and adjustable enough to fit the whole community. Balancing costs and goals. Same software could be used (like in Aalto case), but a fresh installation instead of expanding an existing one also offers a chance to renew processes and get rid of some old history.

64. The main goal of digital campus should be in user and service experience.

Arguments regarding previous claim: User and service experience are important, but they should not override the central goals of higher education. Digital services are done for the people. The systems are going to be made for administration.

Round 2: Desirability average: 3.94, probability average: 2.75

Round 3: Desirability average: 3.94, probability average: 2.71

Arguments regarding previous claim:

- The systems are going to be made for administration.
- Digital services are done for the people.
- User and service experience are important, but they should not override the central goals of higher education.

65. The main goal of digital campus should be in transferring all services and actions independent of time and location.

Round 2: Desirability average: 3.31, probability average: 3

Round 3: Desirability average: 3.24, probability average: 2.94

Arguments regarding previous claim:

- No, the key is in finding the balance between digital and physical. A role for both and an interplay between them.
- The main goal should be learning anytime anywhere. As a by-product, the services will be available anytime.
- This has probably already happened to some extent, so "main" should be substituted with "important"
- Not all services and actions will nor should be independent of time and location. In some instances, they carry a crucial meaning for the experience, thinking and action. Shared time and spaces matter. Learning resources have to be available anytime and anywhere, but this does not mean that, for example, seminars or project teams should be.

66. The main goal of digital campus should be in streamlining services and automating administrative tasks to free resources to the main missions of higher education.

Round 2: Desirability average: 3.63, probability average: 3.06

Round 3: Desirability average: 3.63, probability average: 3.06

Arguments regarding previous claim:

- The main goal of digital admin. Digital campus' main goal should be "enabling the best possible learning" or something like that.
- Digital needs to be scalable. Scalability needs streamlining of processes
- Remembering economical limits
- Again, "main" is very strong word, but this is extremely important aspect to seek. User experience should be added, as streamlined and effective services also cause happiness in work,

67. The main goal of digital campus should be in openness, availability and accessibility of data.

Round 2: Desirability average: 3.69, probability average: 2.75

Round 3: Desirability average: 3.76, probability average: 2.82

Arguments regarding previous claim:

- I second the previous commenter's "To this I'd like to add 'to promote creation of new ideas, to support learning and research'."
- To this I'd like to add "to promote creation of new ideas, to support learning and research".

Claims added for round 3

68. Teaching and learning: It is all about structuring a new type of university. Unfortunately in Finland the structure of our educational system is preventing change.

Finland is an open market for global competition and the hands of Finns have been tied and they can not

participate in global competition. Focus on structures that are limiting our potential is needed.

Round 3: Desirability average: 3.58, probability average: 3.5

Arguments regarding previous claim:

- Competition is very hard in this market. But the barriers should be removed by the government.
- "Focus on structures that are limiting our potential is needed." these structures aren't defined here but they are the key point in this claim... Some claim that tuition fees are the way to go, but look at Sweden or Germany. Some claim that the universities have adopted too much of the private sector's way of doing things. I say the universities have adopted too little of the wrong stuff from the private sector. The worst leadership with the worst measurements...
- Is this a goal or what? I find this impossible to answer.
- I do not agree that the structure somewhat prohibits change. In the end, the change is created by people who seek after it. Focus should be put in the vision and the paths towards it, and to encourage people to take the path to vision. (The desirability-probability-questions do not properly fit to this claim.)
- There are good and excellent features in our current system. Whatever we build, these must be acknowledged and strengthened. Those structures and traditions, however, that cause needless administrative work for researchers and teaching staff need to be abandoned. Yes, Finland is an open market, but the competition from abroad is based on passivising and hierarchical models of higher education. We can still use research and content provided by the "top" universities in the world (for free) and engage the students in learning and creating new knowledge "the Finnish way" and by doing so coach very effective new research teams.

69. Teaching and learning: Digital campus development and implementation requires certain level re-inventing the existing ways of delivering value.

Thus it is essential that it will be approach not merely as a digitization project, but rather as a strategic innovation and exploration project, which involves various different domains of the consortium. With the aim of establishing a new "digital business" model alongside the traditional model.

Round 3: Desirability average: 3.75, probability average: 2.82

Arguments regarding previous claim:

- This is well-said and very much needed.
- Almost by definition, digital development and implementation means business process re-engineering (bpr). BPR doesn't necessarily mean that 30% are going to be laid off. It means just what the claim states: re-inventing the way of doing things in the new world.
- Yes. Digitalisation is a tool to achieve something, and it's uttermost important to create a vision, what is that "something".

70. Academic community: Leading a digital campus is a job for a professional, it should be a well led machine in which academics should feel comfortable (what a challenge!)

Round 3: Desirability average: 4, probability average: 2.92

Arguments regarding previous claim:

- Strong but skillful leadership is a must.
- Any leading is a job for a professional.

71. Openness and accessibility: Openness of software code is just one approach.

More useful - and important - aspect is openness and offering of the API's to approach both public and private data ("my data").

Proper API offering causes savings in the long run (and helps to avoid vendor lock-in), and also offer tools for eager developers. "API first" approach has been used in some cases, and is probably the trending hot topic in the near future. (see like apimanifesti.fi)

Round 3: Desirability average: 3.58, probability average: 3

Arguments regarding previous claim:

- Strong movement into that direction is already happening.
- Interesting
- "But what about security!" someone yells from the corner. APIs are a good way to go, but what prevents for example the student's "virtual desktop" being developed as an open Github-project?
- This is already available as a service of CSC.

72. Digital systems: The main goal of digital campus should be in openness, availability and accessibility of data to promote creation of new ideas and to support learning and research

Round 3: Desirability average: 3.58, probability average: 3.08

Arguments regarding previous claim:

- Well said!
- "An important" instead of "The main"
- Awful lot of arguments for the "main" goal.:) University can only have so many...

Feedback on participation in Delphi panel:

- Much more work than I thought originally.
- Don't see why this had to be in English. Some claims were not well defined - understandable for the first research of the student, but they made the quite long questionnaire hard and time-consuming to answer.
- The survey tool itself was not very good. I wish there had been an easier way to navigate between pages/topics.